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DR250-350 • 1990-1994

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A PRIMEDIA Publication

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SUZUKI

DR250-350 • 1990-1994

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QUICK REFERENCE DATA

TIRE INFLATION PRESSURE

	Front tire	Rear tire
Tire pressure		
DR250 and DR350	14 psi (100 kPa)	14 psi (100 kPa)
DR250S and DR350S		
Solo riding	22 psi (147 kPa)	22 psi (147 kPa)
Dual riding	22 psi (147 kPa)	25 psi (175 kPa)

RECOMMENDED LUBRICANTS AND FUEL

Engine oil	4-cycle oil, SAE 10W/40 API SE or SF motor oil
Front fork oil	10 wt fork oil
Air filter	SAE 10W/40 motor oil or foam air filter oil
Drive chain	Chain lube recommended for O-ring drive chains or SAE 30W/50 engine oil
Control cables	Cable lube
Control lever pivots	10W/30 motor oil
Swing arm pivot shaft	Lithium base waterproof wheel bearing grease
Suspension pivot shaft	Molybdenum disulfide grease
Steering head bearings	Lithium base waterproof wheel bearing grease
Fuel	Regular unleaded grade—research octane 87 or higher
Brake fluid	DOT 4

APPROXIMATE REFILL CAPACITIES

Engine oil	
Periodic oil change	1,700 ml (1.8 U.S. qt./1.5 Imp. qt.)
With filter change	1,900 ml (2.0 U.S. qt./1.7 Imp. qt.)
Engine rebuild	2,100 ml (2.2 U.S. qt./1.8 Imp. qt.)
Front fork (each leg)	
DR250 and DR350	586 ml (19.8 U.S. oz./20.6 Imp. oz.)
DR250S and DR350S	544 ml (18.4 U.S. oz./19.2 Imp. oz.)
Front fork oil level	
DR250 and DR350	145 mm (5.7 in.)
DR250S and DR350S	170 mm (6.7 in.)
Fuel tank	
DR250 and DR350	
Total	9.5 liters (2.5 U.S. gal./2.1 Imp. gal.)
Reserve	1.8 liters (0.5 U.S. gal./0.4 Imp. gal.)
DR250S and DR350S	
49-state and U.K.	
Total	9.0 liters (2.4 U.S. gal./2.0 Imp. gal.)
Reserve	1.5 liters (0.4 U.S. gal./0.3 Imp. gal.)
California	
Total	8.0 liters (2.1 U.S. gal./1.8 Imp. gal.)
Reserve	1.5 liters (0.4 U.S. gal./0.3 Imp. gal.)

MAINTENANCE AND TUNE UP TIGHTENING TORQUES

Item	N•m	ft.-lb.
Crankcase oil drain plug	18-23	13-16.5
Frame oil drain plug	15-20	11-14.5
Oil strainer	25-30	18-21.5
Front axle	50-80	36-58
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Muffler mounting bolts	23-28	16.5-20

TUNE-UP SPECIFICATIONS

Valve clearance (cold)	
Intake	0.05-0.10 mm (0.002-0.004 in.)
Exhaust	0.08-0.13 mm (0.003-0.005 in.)
Spark plug	
Type	NGK DPR9EA-9 or ND X27EPR-U9
Gap	0.8-0.9 mm (0.03-0.04 in.)
Ignition timing	"T" marked-fixed
Idle speed	1400-1600 rpm
Drive chain free play	
DR250 and DR250S	20-40 mm (0.8-1.6 in.)
DR350 and DR350S	25-40 mm (1.0-1.6 in.)

REPLACEMENT BULBS

	DR250DS and DR350S	DR250 and DR350
Headlight	60W/55W (12V)	55W (12V)
Taillight	–	5 W (12V)
Taillight/brake light	21W/5W (12V)	–
Flasher light	21W (12V)	–
License plate light	5W (12V)	–
Position light (U.K.)	3.4W (12V)	–
Meter lights	1.7W (12V)	–

MOTORCYCLE INFORMATION

MODEL:_____ YEAR:_____

VIN NUMBER:_____

ENGINE SERIAL NUMBER:_____

CARBURETOR SERIAL NUMBER OR I.D. MARK:_____

INTRODUCTION

This detailed, comprehensive manual covers the U.S. 1990-1994 Suzuki DR250 and DR250S, the U.S. 1990-1994 DR350 and DR350S, and the U.K. 1990-1994 DR350 and DR350S. The 250 cc model was not available in the U.K.

The expert text gives complete information on maintenance, tune-up, repair and overhaul. Hundreds of photos and drawings guide you through every step. The book includes all you will need to know to keep your Suzuki running right.

A shop manual is a reference. You want to be able to find information fast. As in all Clymer books, this one is designed with you in mind. All chapters are thumb tabbed. Important items are extensively indexed at the rear of the book. All procedures, tables, photos, etc., in this manual are for the reader who may be working on the bike for the first time or using this manual for the first time. All the most frequently used specifications and capacities are summarized in the *Quick Reference Data* pages at the front of the book.

Keep the book handy in your tool box. It will help you better understand how your bike runs, lower repair costs and generally improve your satisfaction with the bike.

CHAPTER ONE

GENERAL INFORMATION

This detailed, comprehensive manual covers the U.S. 1990-1994 Suzuki DR250 and DR250S, the U.S. 1990-1994 DR350 and DR350S, and the U.K. 1990-1994 DR350 and DR350S. The 250 cc model was not available in the U.K.

Troubleshooting, tune-up, maintenance and repair are not difficult, if you know what tools and equipment to use and what to do. Step-by-step instructions guide you through jobs ranging from simple maintenance to complete engine and suspension overhaul.

This manual can be used by anyone from a first time do-it-yourselfer to a professional mechanic. Detailed drawings and clear photographs give you all the information you need to do the work right.

Some of the procedures in this manual require the use of special tools. The resourceful mechanic can, in many cases, think of acceptable substitutes for special tools—there is always another way. This can be as simple as using a few pieces of threaded rod, washers and nuts to remove or install a bearing or fabricating a tool from scrap material. However, using a substitute for a special tool is not recommended as it can be dangerous to and may damage the part. If you find that a tool can be designed and safely made, but will require some type of machine work, you may want to search out a local community college or high school that has a machine shop curriculum. Shop teachers sometimes welcome outside work that can be used as practical shop applications for advanced students.

Table 1 lists model coverage with engine serial numbers. Metric and U.S. standards are used throughout this manual. U.S. to metric conversion is given in **Table 2**.

Tables 1-5 are found at the end of the chapter.

MANUAL ORGANIZATION

This chapter provides general information and discusses equipment and tools useful both for preventive maintenance and troubleshooting.

Chapter Two provides methods and suggestions for quick and accurate diagnosis and repair of problems. Troubleshooting procedures discuss typical symptoms and logical methods to pinpoint the trouble.

Chapter Three explains all periodic lubrication and routine maintenance necessary to keep your Suzuki operating well and competitive. Chapter Three also includes recommended tune-up procedures, eliminating the need to constantly consult other chapters on the various assemblies.

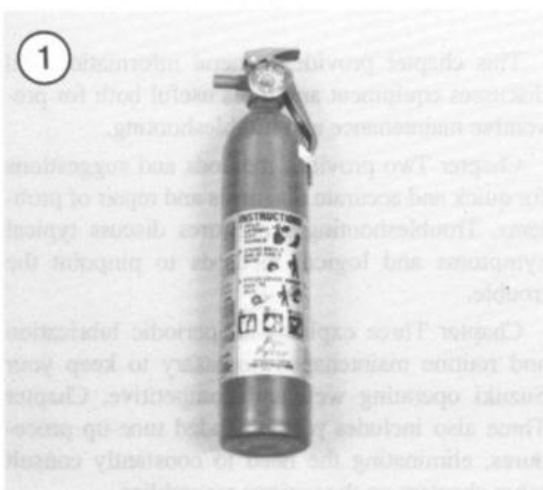
Subsequent chapters describe specific systems such as the engine top end, engine bottom end, clutch, transmission, fuel, exhaust, electrical, suspension, steering and brakes. Each chapter provides disassembly, repair and assembly procedures in simple step-by-step form. If a repair is impractical for a home mechanic, it is so indicated. It is usually faster and less expensive to take such repairs to a Suzuki dealer or competent repair shop. Specifications concerning a particular system are included at the end of the appropriate chapter.

NOTES, CAUTIONS AND WARNINGS

The terms NOTE, CAUTION and WARNING have specific meanings in this manual. A NOTE provides additional information to make a step or procedure easier or clearer. Disregarding a NOTE could cause inconvenience, but would not cause damage or personal injury.

A CAUTION emphasizes areas where equipment damage could occur. Disregarding a CAUTION could cause permanent mechanical damage; however, personal injury is unlikely.

A WARNING emphasizes areas where personal injury or even death could result from negligence. Mechanical damage may also occur. WARNINGS *are to be taken seriously*. In some cases, serious injury and death has resulted from disregarding similar warnings.



SAFETY FIRST

Professional mechanics can work for years and never sustain a serious injury. If you observe a few rules of common sense and safety, you can enjoy many safe hours servicing your own machine. If you ignore these rules you can hurt yourself or damage the equipment.

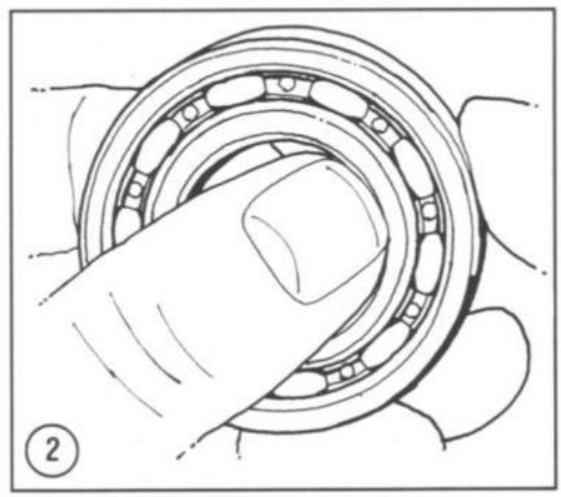
1. *Never* use gasoline as a cleaning solvent.

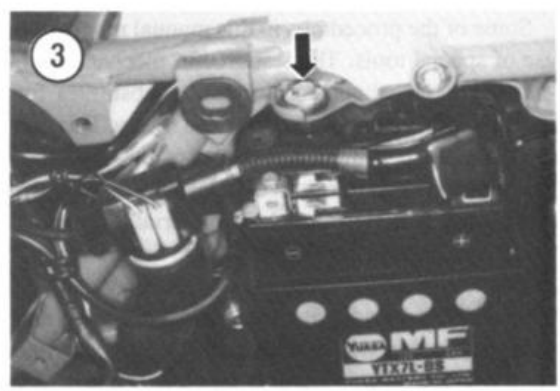
2. *Never* smoke or use a torch in the vicinity of flammable liquids, such as cleaning solvent, in open containers.

3. If welding or brazing is required on the machine, remove the fuel tank and rear shock to a safe distance, at least 50 feet away from the work area.

4. Use the proper sized wrenches to avoid damage to fasteners and injury to yourself.

5. When loosening a tight or stuck nut, be guided by what would happen if the wrench should slip. Be careful; protect yourself accordingly.





6. When replacing a fastener, make sure to use one with the same measurements and strength as the old one. Incorrect or mismatched fasteners can result in damage to the vehicle and possible personal injury. Self-locking nuts should be replaced every time they are removed since the self-locking ability is reduced after the nut is removed. Beware of fastener kits that are filled with cheap and poorly made nuts, bolts, washers and cotter pins. Refer to *Fasteners* in this chapter for additional information.

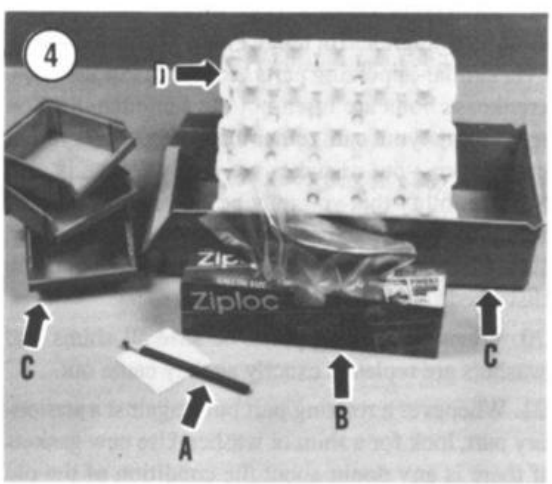
7. Keep all hand and power tools in good condition. Wipe greasy and oily tools after using them. They are difficult to hold and can cause injury. Replace or repair worn or damaged tools.

8. Keep your work area clean and uncluttered.

9. Wear safety goggles during all operations involving drilling, grinding, the use of a cold chisel or anytime you feel unsure about the safety of your eyes. Safety goggles should also be worn anytime solvent and compressed air is used to clean a part.

10. Keep an approved fire extinguisher (**Figure 1**) nearby. Be sure it is rated for gasoline (Class B) and electrical (Class C) fires.

11. When drying bearings or other rotating parts with compressed air, never allow the air jet to rotate the bearing or part. The air jet is capable of rotating them at speeds far in excess of those for which they were designed. The bearing or rotating part is very likely to disintegrate and cause serious injury and damage. To prevent bearing damage when using compressed air, hold the inner bearing race by hand (**Figure 2**).



SERVICE HINTS

Most of the service procedures covered are straightforward and can be performed by anyone reasonably handy with tools. It is suggested, however, that you consider your own capabilities carefully before attempting any operation involving major disassembly of the engine or transmission.

Take your time and do the job right. Do not forget that a newly rebuilt engine must be broken in the same way as a new one. Keep the rpm's within the limits given in your Suzuki owner's manual when you get back on the road or out in the dirt

1. "Front," as used in this manual, refers to the front of the motorcycle; the front of any component is the end closest to the front of the motorcycle. The "left-" and "right-hand" sides refer to the position of the parts as viewed by a rider sitting on the seat facing forward. For example, the throttle control is on the right-hand side. These rules are simple, but confusion can cause a major inconvenience during service.

2. Whenever servicing the engine or clutch, or when removing a suspension component, the bike should be secured in a safe manner. An excellent support for Suzuki is a wooden box or stand. A sturdy box can be made with 3/4 in. plywood that will last a long time if constructed well.

WARNING

Never disconnect the positive (+) battery cable unless the negative (–) cable has first been disconnected. Disconnecting the positive cable while the negative cable is still connected may cause a spark. This could ignite hydrogen gas given off by the battery, causing an explosion.

3. Disconnect the negative battery cable (**Figure 3**), located under the frame left-hand side cover, when working on or near the electrical, clutch, or starter systems and before disconnecting any electrical wires. On most batteries, the negative terminal will be marked with a minus (–) sign and the positive terminal with a plus (+) sign.

4. Tag all similar internal parts for location and mark all mating parts for position (A, **Figure 4**). Record number and thickness of any shims as they are removed. Small parts such as bolts can be identified by placing them in plastic sandwich bags (B, **Figure 4**). Seal and label them with masking tape.

5. Place parts from a specific area of the engine (e.g. cylinder head, cylinder, clutch, shift mechanism, etc.) into plastic boxes (C, **Figure 4**) to keep them separated.

6. When disassembling transmission shaft assemblies, use an egg flat (the type that restaurants get their eggs in) (D, **Figure 4**) and set the parts from the shaft in one of the depressions in the same order in which is was removed.

7. Wiring should be tagged with masking tape and marked as each wire is removed. Again, do not rely on memory alone.

8. Finished surfaces should be protected from physical damage or corrosion. Keep gasoline and brake fluid off painted surfaces.

9. Use penetrating oil on frozen or tight bolts, then strike the bolt head a few times with a hammer and punch (use a screwdriver on screws). Avoid the use of heat where possible, as it can warp, melt or affect the temper of parts. Heat also ruins finishes, especially paint and plastics.

10. No parts removed or installed (other than bushings and bearings) in the procedures given in this manual should require unusual force during disassembly or assembly. If a part is difficult to remove or install, find out why before proceeding.

11. Cover all openings after removing parts or components to prevent dirt, small tools, etc. from falling in.

12. Read each procedure *completely* while looking at the actual parts before starting a job. Make sure you *thoroughly* understand what is to be done and then carefully follow the procedure, step by step.

13. Recommendations are occasionally made to refer service or maintenance to a Suzuki dealer or a specialist in a particular field. In these cases, the work will be done more quickly and economically than if you performed the job yourself.

14. In procedural steps, the term "replace" means to discard a defective part and replace it with a new or exchange unit. "Overhaul" means to remove, disassemble, inspect, measure, repair or replace defective parts, reassemble and install major systems or parts.

15. Some operations require the use of a hydraulic press. It would be wiser to have these operations performed by a shop equipped for such work, rather than to try to do the job yourself with makeshift equipment that may damage your machine.

16. Repairs go much faster and easier if your machine is clean before you begin work. There are many special cleaners on the market, like Bel-Ray Degreaser, for washing the engine and related parts. Follow the manufacturer's directions on the container for the best results. Clean all oily or greasy parts with cleaning solvent as you remove them. See *Washing the Bike* in this chapter.

WARNING

***Never** use gasoline as a cleaning agent. It presents an extreme fire hazard. Be sure to work in a well-ventilated area when using cleaning solvent. Keep a fire extinguisher, rated for gasoline fires, handy in any case.*

CAUTION

If you use a car wash to clean your bike, don't direct the high pressure water hose at fork seals, steering bearings, carburetor hoses, suspension linkage components, wheel bearings, electrical components (e.g. instrument cluster) and muffler outlet. The water will flush grease out of the bearings or damage the seals.

17. Much of the labor charges for repairs made by dealers are for the time involved in the removal, disassembly, assembly and reinstallation of other parts in order to reach the defective part. It is frequently possible to perform the preliminary operations yourself and then take the defective unit to the dealer for repair at considerable savings.

18. If special tools are required, make arrangements to get them before you start. It is frustrating and time-consuming to get partly into a job and then be unable to complete it.

19. Make diagrams (or take a Polaroid picture) wherever similar-appearing parts are found. For instance, crankcase bolts are often not the same length. You may think you can remember where everything came from—but mistakes are costly. There is also the possibility that you may be sidetracked and not return to work for days or even weeks—in which time the carefully laid out parts may have become disturbed.

20. When assembling parts, be sure all shims and washers are replaced exactly as they came out.

21. Whenever a rotating part butts against a stationary part, look for a shim or washer. Use new gaskets if there is any doubt about the condition of the old

ones. A thin coat of oil on non-pressure type gaskets may help them seal more effectively.

22. High spots may be sanded off a piston with sandpaper, but fine emery cloth and oil will do a much more professional job.

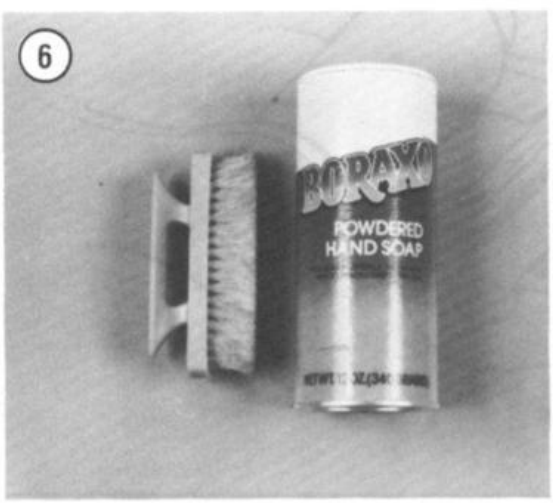
23. Carbon can be removed from the head, the piston crown and the exhaust port with a dull screwdriver. Do *not* scratch machined surfaces. Wipe off the surface with a clean cloth when finished.

24. A baby bottle makes a good measuring device for adding oil to the front forks. Get one that is graduated in fluid ounces and cubic centimeters. After it has been used for this purpose, do *not* let a small child drink out of it as there will always be an oil residue in it.

25. If it is necessary to make a clutch cover or ignition cover gasket and you do not have a suitable old gasket to use as a guide, you can use the outline of the cover and gasket material to make a new gasket. Apply engine oil to the cover gasket surface. Then place the cover on the new gasket material and apply pressure with your hands. The oil will leave a very accurate outline on the gasket material that can be cut around.

CAUTION

When purchasing gasket material to make a gasket, measure the thickness of the old gasket and purchase gasket material with the same approximate thickness.



26. Heavy grease can be used to hold small parts in place if they tend to fall out during assembly. However, keep grease and oil away from electrical and brake components.

27. A carburetor is best cleaned by disassembling it and soaking the parts in a commercial carburetor cleaner. Never soak gaskets and rubber parts in these cleaners. Never use wire to clean out jets and air passages. They are easily damaged. Use compressed air to blow out the carburetor only if the float has been removed first.

28. There are many items available that can be used on your hands before and after working on your bike. A little preparation prior to getting "all greased up" will help when cleaning up later. Before starting out, work Vaseline, soap or a skin protection product such as Invisible Glove (**Figure 5**) onto your forearms, into your hands and under your fingernails and cuticles. This will make cleanup a lot easier. For cleanup, use a waterless hand soap such as Sta-Lube and then finish up with powdered Boraxo and a fingernail brush (**Figure 6**).

WASHING THE BIKE

The Suzuki DR250 and DR350 models are an off-road motorcycle and if you are riding it often and maintaining it properly, you will spend a good deal of time cleaning it. The Suzuki DR250S and DR350S models are a dual-purpose motorcycle that is meant to be ridden on the highway as well as off road. If you are doing a lot of off-road riding and maintaining it properly, you will spend a good deal of time cleaning it. After riding your Suzuki off-road, wash the bike. It will make maintenance and service procedures quick and easy. More important, proper cleaning will prevent dirt from falling into critical areas undetected. Failing to clean the bike or

cleaning it incorrectly will add to your maintenance costs and shop time because dirty parts wear out prematurely. It's unthinkable that your bike could break because of improper cleaning, but it can happen.

When cleaning your Suzuki, you will need a few tools, shop rags, scrub brush, bucket, liquid cleaner and access to water. Many riders use a coin-operated car wash. Coin-operated car washes are convenient and quick, but with improper use, the high water pressures can do more damage than good to your bike.

NOTE

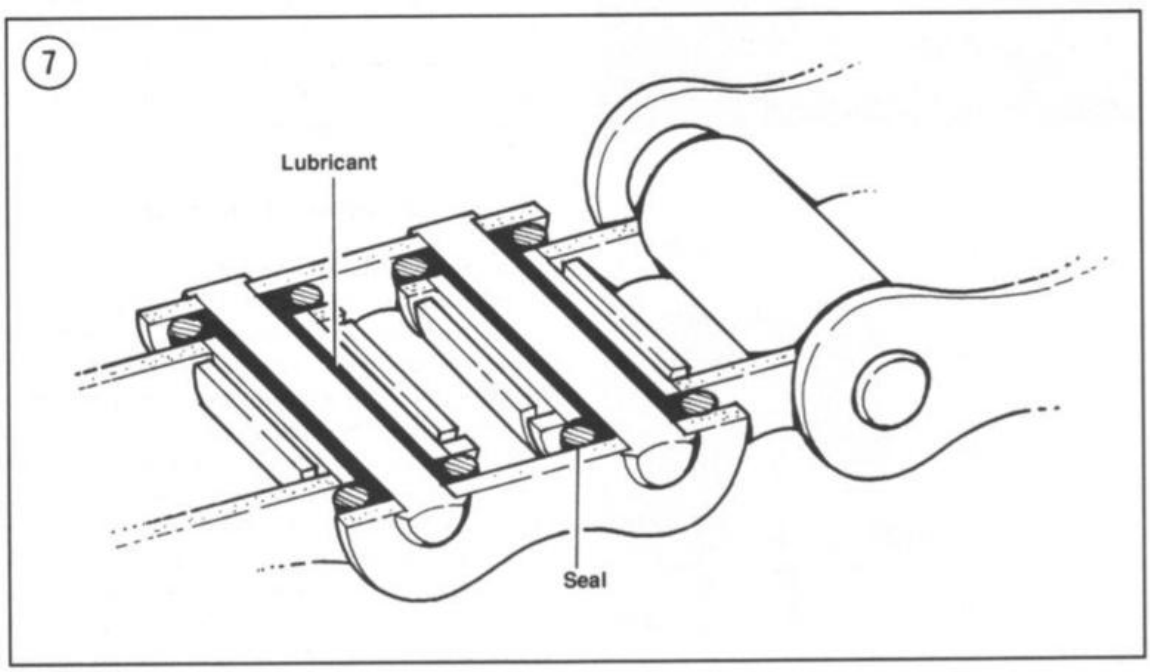
A safe biodegradable, non-toxic and non-flammable liquid cleaner that works well for washing your bike as well as for removing grease and oil from engine and suspension parts is Simple Green. Simple Green can be purchased through some supermarkets, hardware, garden and discount supply houses. Follow the directions on the container for recommended dilution ratios.

When cleaning your bike and especially when using a spray type degreaser, remember that what goes on the bike will rinse off and drip onto your driveway or into your yard. If you can, use a degreaser at a coin-operated car wash. If you are cleaning your bike at home, place thick cardboard or newspapers underneath the bike to catch the oil and grease deposits that are rinsed off.

CAUTION

*The factory installed drive chain on all DR Series models has O-rings installed between the chain plates. Lubrication for the chain pins is sealed by the O-rings (**Figure 7**). However, the chain rollers require external oiling. For the O-ring chain to work properly, it requires proper cleaning and lubrication practices. Do not clean the O-ring drive chain with a high-pressure water hose, such as those found in coin-operated car washes. The high pressure can damage the O-rings and cause pre-mature chain failure. If you are using a degreaser to clean your bike, note that the degreaser may damage the chain's rubber or neoprene O-rings. Always check that the degreaser is specified for use on O-ring type chains. See **Chain Cleaning** in Chapter Three for additional information on drive chain cleaning and lubrication. If possible, remove the drive chain before cleaning the bike.*

1. Place the bike on a stand.
2. Check the following before washing the bike:



a. Make sure the fuel filler cap (A, **Figure 8**) is on tightly.
b. Make sure the oil fill cap (B, **Figure 8**) is screwed on tight.
c. Plug the muffler opening with a large cork or rag.

3. Wash the bike from top to bottom with soapy water. Use the scrub brush to get excess dirt out of the wheel rims and engine crannies and skid plate. Concentrate on the upper controls, engine, side panels and gas tank during this wash cycle. Don't forget to wash dirt and mud from underneath the fenders and engine crankcase.

4. Remove the gas tank, frame side panels and seat. Wrap a plastic bag around the ignition coil and CDI unit. Concentrate the second wash cycle on the frame tube members, outer air box areas, suspension linkage, rear shock and swing arm.

5. Direct the hose underneath the engine and swing arm. Wash this area thoroughly. If this area is extremely dirty, you may want to lay the bike on its side. Protect the finish when laying the bike down.

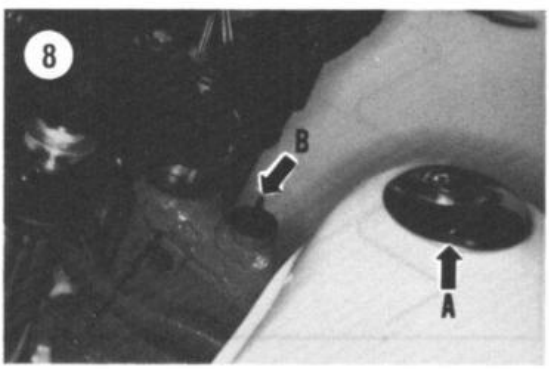
6. The final wash is the rinse. Use cold water without soap and spray the entire motorcycle again. Use as much time and care when rinsing the bike as when washing it. Built up soap deposits will quickly corrode electrical connections and remove the natural oils from tires, causing premature cracks and wear. Make sure you thoroughly rinse the bike off.

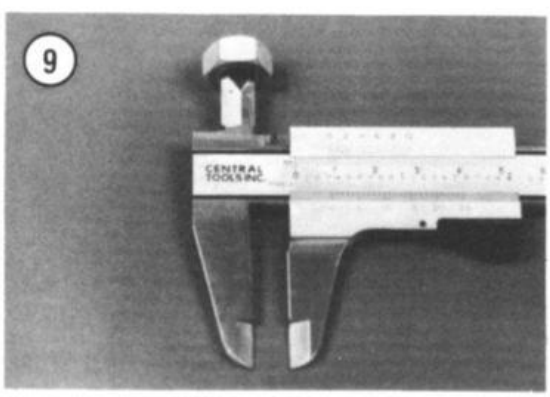
7. Tip the bike from side-to-side to allow any water that has collected on horizontal surfaces to drain off.

8. Immediately after rinsing off the bike, unplug the muffler opening and start the engine. Idle the engine to burn off any internal moisture. Idle the bike long enough to use the gas remaining in the float bowl. This will prevent fuel leakage problems when cleaning the carburetor later.

9. Before taking the bike into the garage, wipe it dry with a shop rag. Inspect the machine as you dry it for further signs of dirt and grime. Make a quick visual inspection of the frame and other painted pieces. Spray any worn-down spots with WD-40 or Bel-Ray 6-in-1 to prevent rust from building on the bare metal. When the bike is back at your work area you can repaint the bare areas with touch-up paint after wiping off the WD-40. A quick shot from a touch-up paint can each time you work on the bike will keep it looking sharp and stop rust from building and weakening parts.

10. Lubricate the drive chain with a specially approved drive chain lubricant specified for O-ring use. See Chapter Three.





TORQUE SPECIFICATIONS

Torque specifications throughout this manual are given in Newton-meters (N•m) and foot-pounds (ft.-lb.).

Existing torque wrenches calibrated in meter kilograms can be used by performing a simple conversion. All you have to do is move the decimal point one place to the right; for example, 3.5 mkg = 35 N•m. This conversion is accurate enough for mechanical work even though the exact mathematical conversion is 3.5 mkg = 34.3 N•m.

Refer to **Table 3** for standard torque specifications for various size screws, bolts and nuts that may not be listed in the respective chapters. To use the table, first determine the size of the bolt or nut. Use a vernier caliper and measure the inside dimension of the threads of the nut (**Figure 9**) and across the threads for a bolt (**Figure 10**).

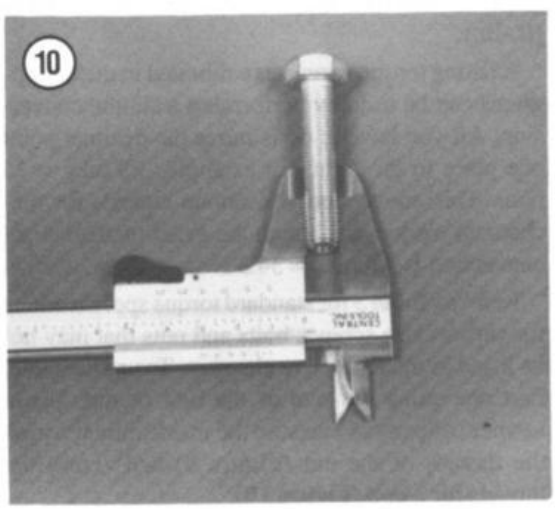
FASTENERS

The materials and designs of the various fasteners used on your Suzuki are not arrived at by chance or accident. Fastener design determines the type of tool required to work the fastener. Fastener material is carefully selected to decrease the possibility of physical failure.

Nuts, bolts and screws are manufactured in a wide range of thread patterns. To join a nut and bolt, the diameter of the bolt and the diameter of the hole in the nut must be the same. It is just as important that the threads on both be properly matched.

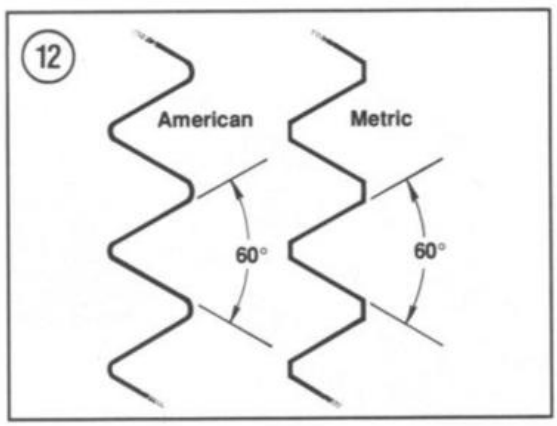
The best way to tell if the threads on 2 fasteners are matched is to turn the nut on the bolt (or the bolt into the threaded hole in a piece of equipment) with fingers only. Be sure both pieces are clean. If much force is required, check the thread condition on each fastener. If the thread condition is good but the fasteners jam, the threads are not compatible. A thread pitch gauge (**Figure 11**) can also be used to determine pitch. Suzuki motorcycles are manufactured with ISO (International Organization for Standardization) metric fasteners. The threads are cut differently than that of American fasteners (**Figure 12**).

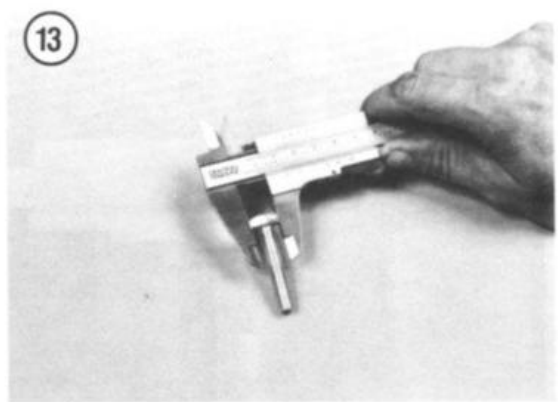
Most threads are cut so that the fastener must be turned clockwise to tighten it. These are called right-hand threads. Some fasteners have left-hand threads; they must be turned counterclockwise to be tightened. Left-hand threads are used in locations where normal rotation of the equipment would tend to loosen a right-hand threaded fastener.



ISO Metric Screw Threads

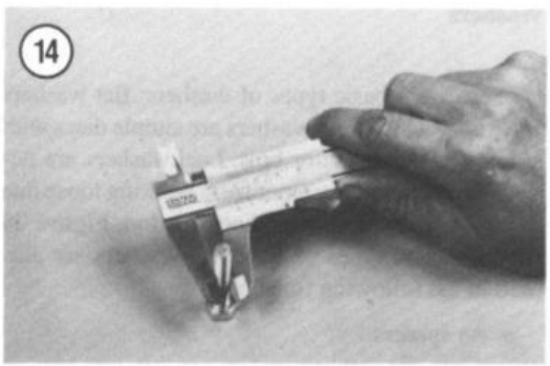
ISO (International Organization for Standardization) metric threads come in 3 standard thread sizes: coarse, fine and constant pitch. The ISO coarse pitch is used for most all common fastener applications. The fine pitch thread is used on certain precision tools and instruments. The constant pitch thread is used mainly on machine parts and not for fasten-

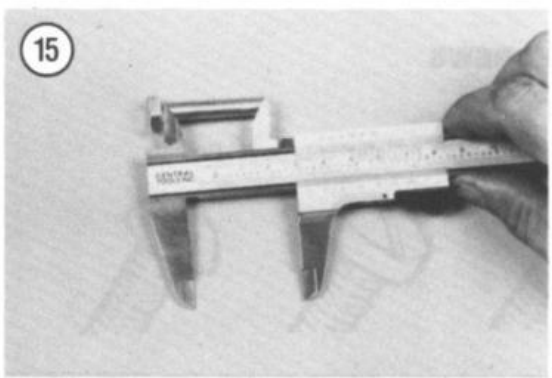




ers. The constant pitch thread, however, is used on all metric thread spark plugs.

ISO metric threads are specified by the capital letter M followed by the diameter in millimeters and the pitch (or the distance between each thread) in millimeters separated by the sign ×. For example a M8 × 1.25 bolt is one that has a diameter of 8 millimeters with a distance of 1.25 millimeters between each thread. The measurement across 2 flats on the head of the bolt (**Figure 13**) indicates the proper wrench size to be used. **Figure 14** shows how to determine bolt diameter.





NOTE

*When purchasing a bolt from a dealer or parts store, it is important to know how to specify bolt length. The correct way to measure bolt length is by measuring the length starting from underneath the bolt head to the end of the bolt (**Figure 15**). Always measure bolt length in this manner to avoid purchasing bolts that are too long.*

Machine Screws

There are many different types of machine screws. **Figure 16** shows a number of screw heads requiring different types of turning tools. Heads are also designed to protrude above the metal (round) or to be slightly recessed in the metal (flat). See **Figure 17**.

Bolts

Commonly called bolts, the technical name for these fasteners is cap screws. Metric bolts are described by the diameter and pitch (or the distance between each thread). For example a M8 × 1.25 bolt is one that has a diameter of 8 millimeters and a distance of 1.25 millimeters between each thread. The measurement across 2 flats on the head of the bolt (**Figure 13**) indicates the proper wrench size to be used. Use a vernier caliper and measure across the threads (**Figure 14**) to determine the bolt diameter and to measure the length (**Figure 15**).

Nuts

Nuts are manufactured in a variety of types and sizes. Most are hexagonal (6-sided) and fit on bolts, screws and studs with the same diameter and pitch.

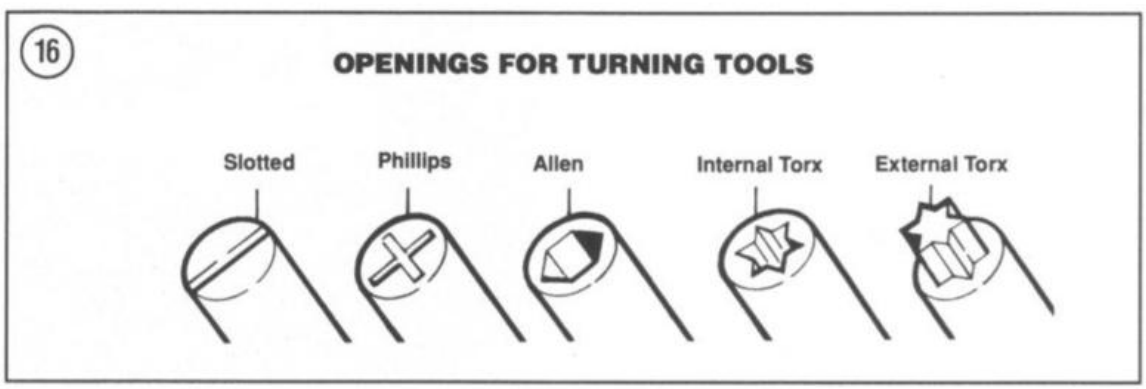


Figure 18 shows several types of nuts. The common nut is generally used with a lockwasher. Self-locking nuts have a nylon insert which prevents the nut from loosening; no lockwasher is required. Wing nuts are designed for fast removal by hand. Wing nuts are used for convenience in non-critical locations.

To indicate the size of a metric nut, manufacturers specify the diameter of the opening and the thread pitch. This is similar to bolt specifications, but without the length dimension. The measurement across 2 flats on the nut indicates the proper wrench size to be used (**Figure 19**).

Self-Locking Fasteners

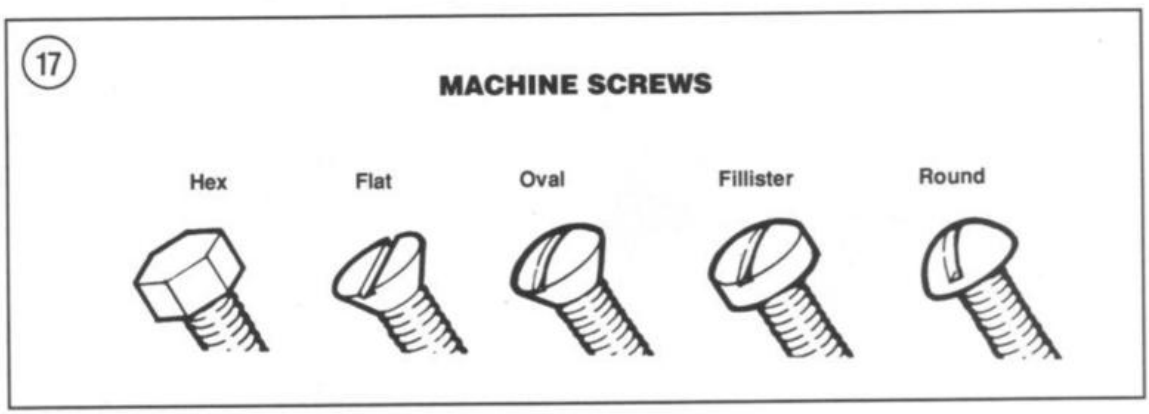
Several types of bolts, screws and nuts incorporate a system that develops an interference between the bolt, screw, nut or tapped hole threads. Interference is achieved in various ways: by distorting threads, coating threads with dry adhesive or nylon, distorting the top of an all-metal nut, using a nylon insert in the center or at the top of a nut, etc.

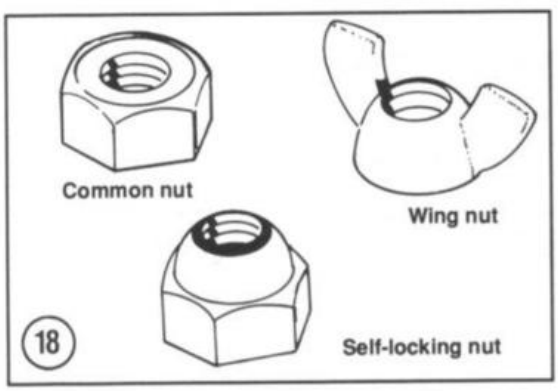
Self-locking fasteners offer greater holding strength and better vibration resistance. Some self-locking fasteners can be reused if in good condition. Others, like the nylon insert nut, form an initial locking condition when the nut is first installed; the nylon forms closely to the bolt thread pattern, thus reducing any tendency for the nut to loosen. When the nut is removed, the locking efficiency is greatly reduced. For greatest safety, it is recommended that you install new self-locking fasteners whenever they are removed.

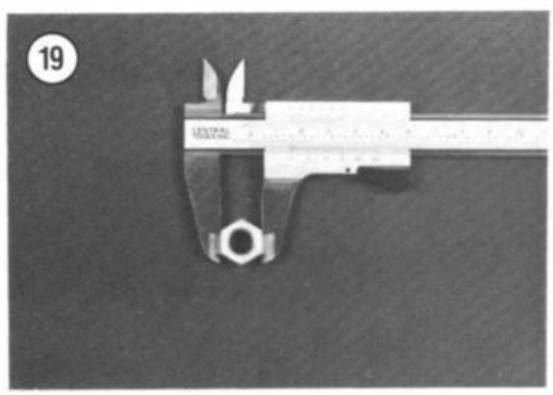
Washers

There are 2 basic types of washers: flat washers and lockwashers. Flat washers are simple discs with a hole to fit a screw or bolt. Lockwashers are designed to prevent a fastener from working loose due to vibration, expansion and contraction. **Figure 20** shows several types of washers. Washers are also used in the following functions:

a. As spacers.





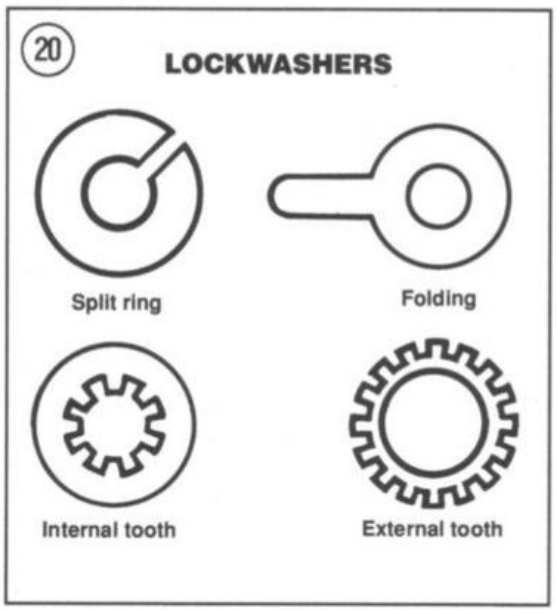


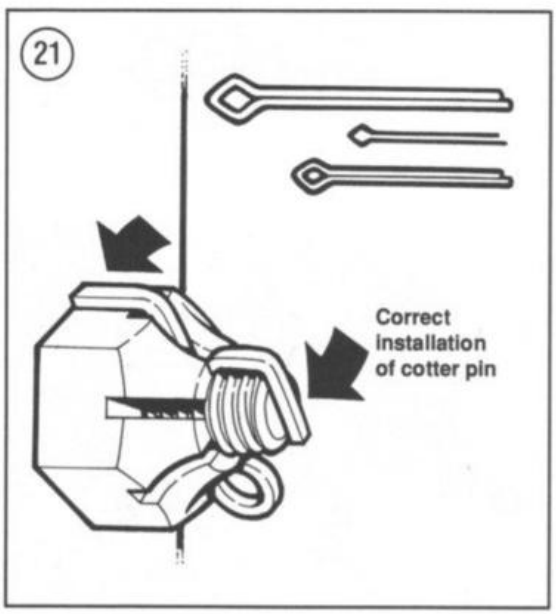
b. To prevent galling or damage of the equipment by the fastener.

c. To help distribute fastener load during torquing.

d. As seals.

Note that flat washers are often used between a lockwasher and a fastener to provide a smooth bearing surface. This allows the fastener to be turned easily with a tool.





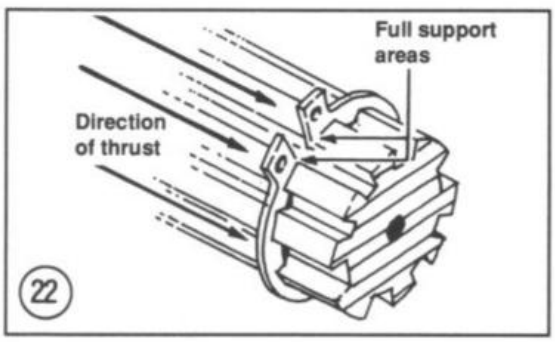
Cotter Pins

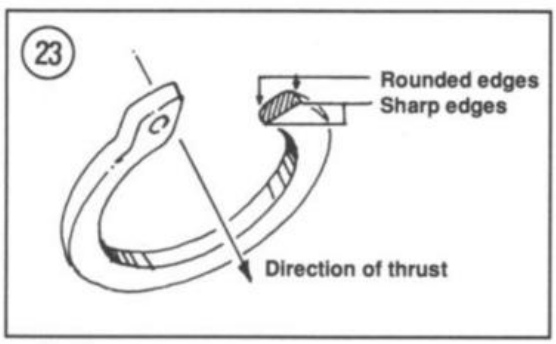
Cotter pins (**Figure 21**) are used to secure special kinds of fasteners. The threaded stud must have a hole in it; the nut or nut lock piece has castellations around which the cotter pin ends wrap. Cotter pins should not be reused after removal.

Circlips

Circlips can be internal or external design. They are used to retain items on shafts (external type) or within tubes (internal type). In some applications, circlips of varying thicknesses are used to control the end play of parts assemblies. These are often called selective circlips. Circlips should be replaced during installation, as removal weakens and deforms them.

Two basic styles of circlips are available: machined and stamped circlips. Machined circlips (**Figure 22**) can be installed in either direction (shaft or housing) because both faces are machined, thus creating two sharp edges. Stamped circlips (**Figure 23**) are manufactured with one sharp edge and one rounded edge. When installing stamped circlips in a thrust situation (transmission shafts, fork tubes, etc.), the sharp edge must face away from the part





producing the thrust. When installing circlips, observe the following:

a. Compress or expand circlips only enough to install them.
b. After the circlip is installed, make sure it is completely seated in its groove.

Transmission circlips become worn with use and increase side play. For this reason, always use new circlips whenever a transmission is being reassembled.

LUBRICANTS

Periodic lubrication assures long life for any type of equipment. The *type* of lubricant used is just as important as the lubrication service itself, although in an emergency the wrong type of lubricant is better than none at all. The following paragraphs describe the types of lubricants most often used on motorcycle equipment. Be sure to follow the manufacturer's recommendations for lubricant types.

Generally, all liquid lubricants are called "oil." They may be mineral-based (including petroleum bases), natural-based (vegetable and animal bases), synthetic-based or emulsions (mixtures). "Grease" is an oil to which a thickening base has been added so that the end product is semi-solid. Grease is often classified by the type of thickener added; lithium soap is commonly used.

Engine Oil

Four-cycle oil for motorcycle and automotive engines is graded by the American Petroleum Institute (API) and the Society of Automotive Engineers (SAE) in several categories. Oil containers display these ratings on the top or label.

API oil grade is indicated by letters; oils for gasoline engines are identified by an "S." Suzuki models described in this manual require SE or SF graded oil.

Viscosity is an indication of the oil's thickness. The SAE uses numbers to indicate viscosity; thin oils have low numbers while thick oils have high numbers. A "W" after the number indicates that the viscosity testing was done at low temperature to simulate cold-weather operation. Engine oils fall into the 5W-30 and 20W-50 range.

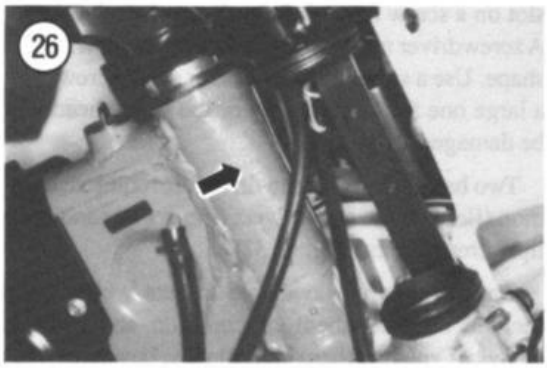
Multi-grade oils (for example 10W-40) are less viscous (thinner) at low temperatures and more viscous (thicker) at high temperatures. This allows the oil to perform efficiently across a wide range of engine operating conditions. The lower the number, the better the engine will start in cold climates. Higher numbers are usually recommended for engines running in hot weather conditions.

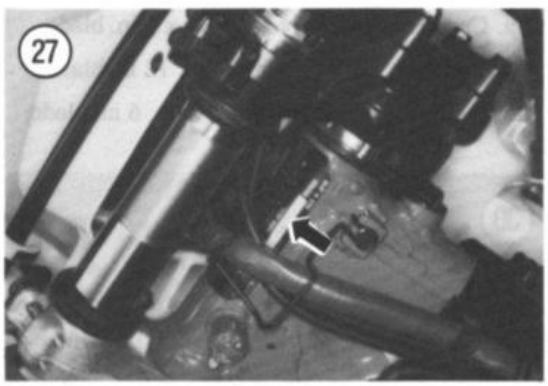
Grease

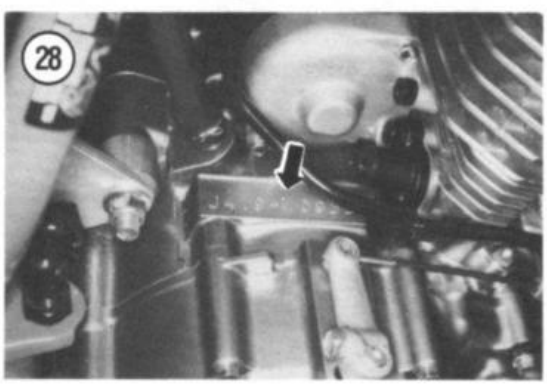
Greases are graded by the National Lubricating Grease Institute (NLGI). Greases are graded by number according to the consistency of the grease; these range from No. 000 to No. 6, with No. 6 being the most solid. A typical multipurpose grease is NLGI No. 2. For specific applications, equipment manufacturers may require grease with an additive such as molybdenum disulfide (MOS2) (**Figure 24**).

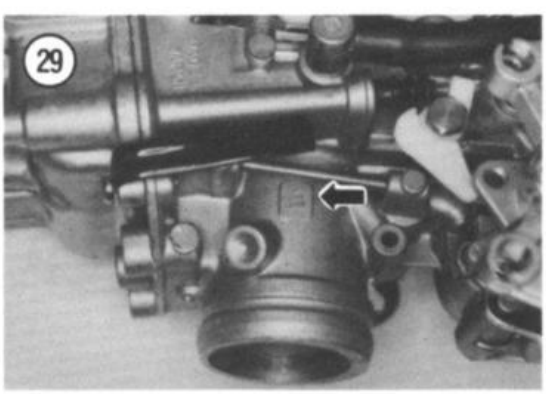
EXPENDABLE SUPPLIES

Certain expendable supplies are required during maintenance and repair work. These include grease, oil, gasket cement, wiping rags and cleaning solvent. Ask your dealer for the special locking compounds, silicone lubricants and other products (**Figure 25**) which make vehicle maintenance simpler and easier. Cleaning solvent or kerosene is available at some service stations or hardware stores.









WARNING

Having a stack of clean shop rags on hand is important when performing engine and suspension service work. However, to prevent the possibility of fire damage from spontaneous combustion from a pile of solvent soaked rags, store them in a lid sealed metal container until they can be washed or discarded.

NOTE

To avoid absorbing solvent and other chemicals into your skin while cleaning parts, wear a pair of petroleum-resistant rubber gloves. These can be purchased through industrial supply houses or well-equipped hardware stores.

PARTS REPLACEMENT

Suzuki makes frequent changes during a model year, some minor, some relatively major. When you order parts from the dealer or other parts distributor, always order by frame and engine numbers.

The frame number is stamped on the right-hand side of the steering head pipe (**Figure 26**). The vehicle identification number (VIN) plate is attached to the left-hand side of the steering head pipe (**Figure 27**). The engine number is stamped on a raised pad on the right-hand crankcase (**Figure 28**). The carburetor number (**Figure 29**) is on the right-hand side of the carburetor body.

Write the numbers down and carry them with you. Compare new parts to old before purchasing them. If they are not alike, have the parts manager explain the difference to you.

NOTE

If your Suzuki was purchased second-hand and you are not sure of its model year, use the bike's engine serial number and the information listed in ***Table 1****. Read your bike's engine serial number. Then compare the number with the engine and serial numbers listed in* ***Table 1****. If your bike's serial number is listed in* ***Table 1****, cross-reference the number with the adjacent model number and year.*

BASIC HAND TOOLS

Many of the procedures in this manual can be carried out with simple hand tools and test equipment familiar to the average home mechanic. Keep your tools clean and in a tool box. Keep them organized with the sockets and related drives together, the open-end combination wrenches together, etc. After using a tool, wipe off dirt and grease with a clean cloth and return the tool to its correct place.

Top quality tools are essential; they are also more economical in the long run. If you are now starting to build your tool collection, stay away from the "advertised specials" featured at some parts houses, discount stores and chain drug stores. These are usually a poor grade tool that can be sold cheaply and that is exactly what they are—*cheap*. They are usually made of inferior material, and are thick, heavy and clumsy. Their rough finish makes them difficult to clean and they usually don't last very long. If it is ever your misfortune to use such tools, you will probably find out that the wrenches do not fit the heads of bolts and nuts correctly and damage the fastener.

Quality tools are made of alloy steel and are heat treated for greater strength. They are lighter and better balanced than cheap ones. Their surface is smooth, making them a pleasure to work with and easy to clean. The initial cost of good quality tools may be more but they are cheaper in the long run. Don't try to buy everything in all sizes in the beginning; do it a little at a time until you have the necessary tools.

The following tools are required to perform virtually any repair job on a bike. Each tool is described and the recommended size given for starting a tool collection. **Table 4** includes the tools that should be on hand for simple home repairs and/or major overhaul as shown in **Figure 30**. Additional tools and some duplicates may be added as you become more familiar with the bike. Almost all motorcycles and bikes (with the exception of the U.S.-built Harley and some English bikes) use metric size bolts and nuts. If you are starting your collection now, buy metric sizes.

Screwdrivers

The screwdriver is a very basic tool, but if used improperly it will do more damage than good. The slot on a screw has a definite dimension and shape. A screwdriver must be selected to conform with that shape. Use a small screwdriver for small screws and a large one for large screws or the screw head will be damaged.

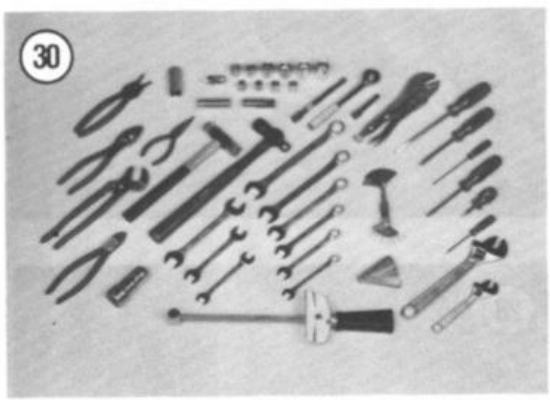
Two basic types of screwdriver are required: common (flat-blade) screwdrivers (**Figure 31**) and Phillips screwdrivers (**Figure 32**).

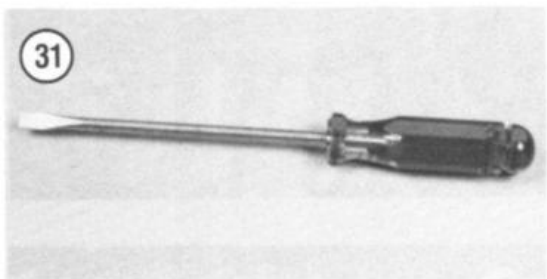
Screwdrivers are available in sets which often include an assortment of common and Phillips blades. If you buy them individually, buy at least the following:

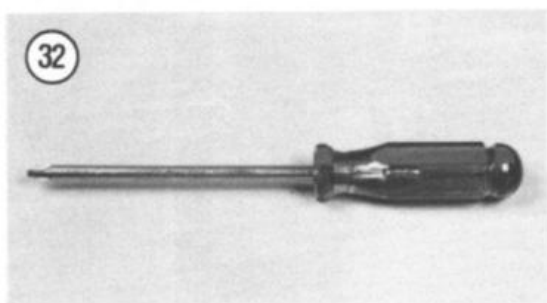
a. Common screwdriver—5/16 × 6 in. blade.

b. Common screwdriver—3/8 × 12 in. blade.

c. Phillips screwdriver—size 2 tip, 6 in. blade.







Use screwdrivers only for driving screws. Never use a screwdriver for prying or chiseling metal. Do not try to remove a Phillips or Allen head screw with a common screwdriver (unless the screw has a combination head that will accept either type); you can damage the head so that the proper tool will be unable to remove it.

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Keep screwdrivers in the proper condition and they will last longer and perform better. Always keep the tip of a common screwdriver in good condition. **Figure 33** shows how to grind the tip to the proper shape if it becomes damaged. Note the symmetrical sides of the tip.

Pliers

Pliers come in a wide range of types and sizes. Pliers are useful for cutting, bending and crimping. They should never be used to cut hardened objects or to turn bolts or nuts. **Figure 34** shows several pliers useful in motorcycle repairs.

Each type of pliers has a specialized function. Slip-joint pliers are general purpose pliers and are used mainly for holding things and for bending.

Needlenose pliers are used to hold or bend small objects. Channel lock pliers can be adjusted to hold various sizes of objects; the jaws remain parallel to

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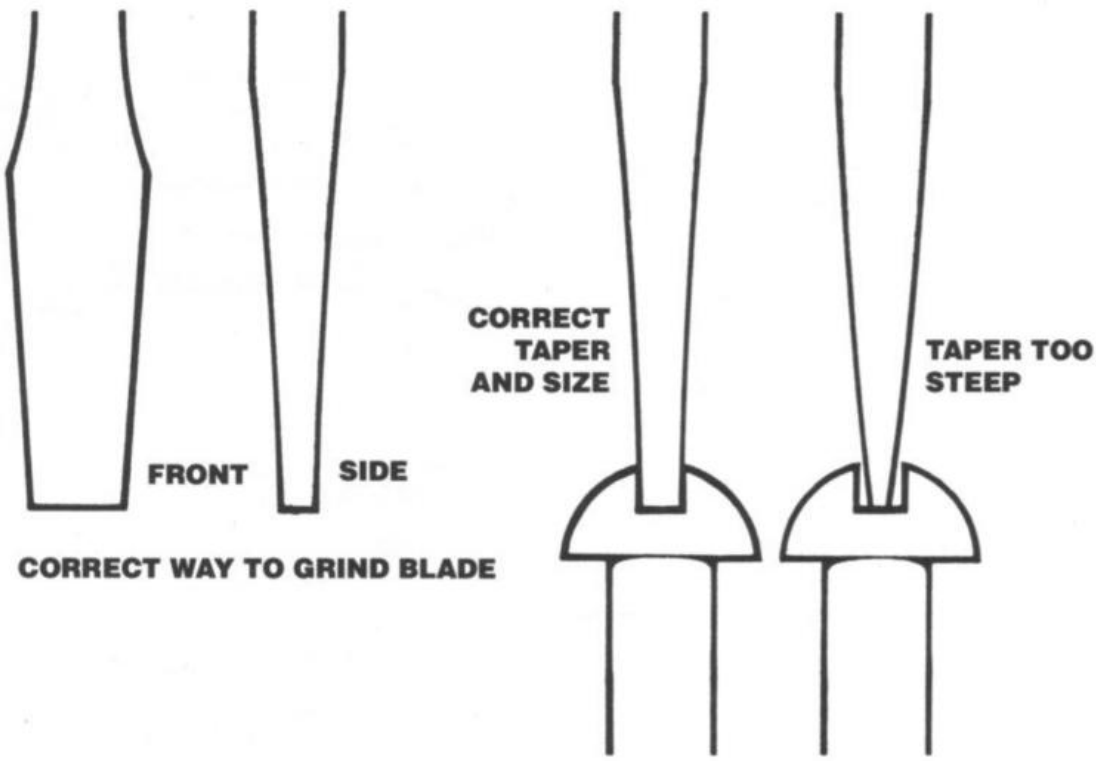
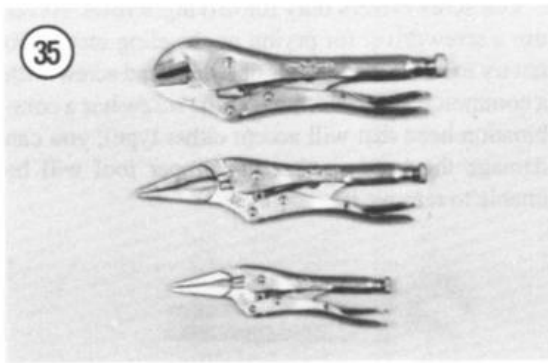


grip around objects such as pipe or tubing. There are many more types of pliers. The ones described here are most suitable for bike repairs.

Vise-grip Pliers

Vise-grip pliers (**Figure 35**) are used to hold objects very tightly like a vise. But avoid using them unless absolutely necessary since their sharp jaws will permanently scar any objects which are held. Vise-grip pliers are available in many types for more specific tasks.

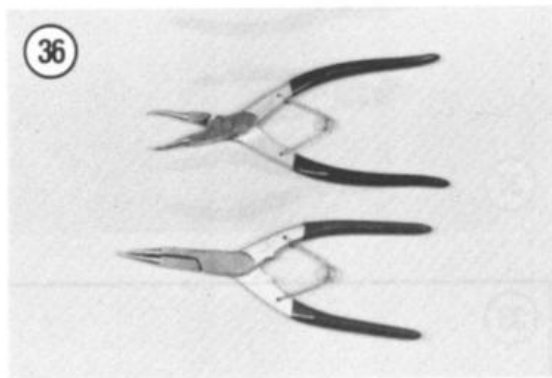


Circlip Pliers

Circlip pliers (**Figure 36**) are special in that they are only used to remove circlips from shafts or within engine or suspension housings. When purchasing circlip pliers, there are two kinds to distinguish from. External pliers (spreading) are used to remove circlips that fit on the outside of a shaft. Internal pliers (squeezing) are used to remove circlips which fit inside a gear or housing.

WARNING

Because circlips can sometimes slip and "fly off" during removal and installation, always wear safety glasses.

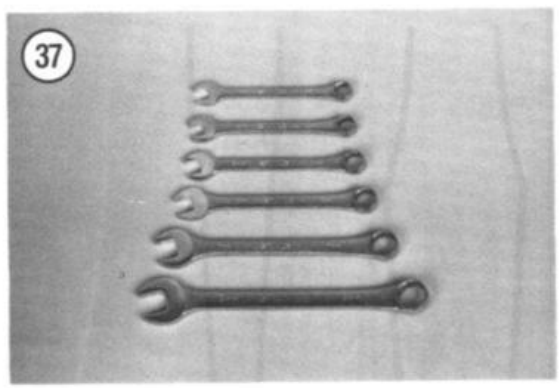


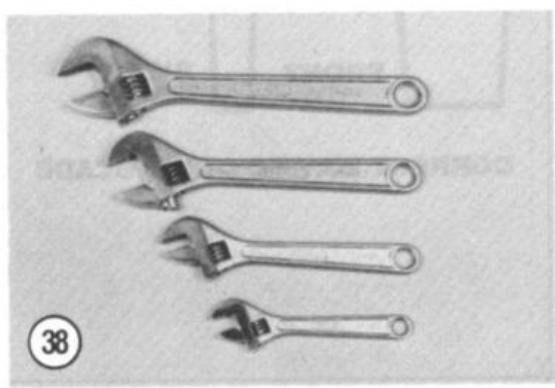
Box-end, Open-end and Combination Wrenches

Box-end, open-end and combination wrenches are available in sets or separately in a variety of sizes. On open- and box-end wrenches, the number stamped near the end refers to the distance between 2 parallel flats on the hex head bolt or nut. On combination wrenches, the number is stamped near the center.

Box-end wrenches require clear overhead access to the fastener but can work well in situations where the fastener head is close to another part. They grip on all six edges of a fastener for a very secure grip. They are available in either 6-point or 12-point. The 6-point gives superior holding power and durability but requires a greater swinging radius. The 12-point works better in situations with limited swinging radius.

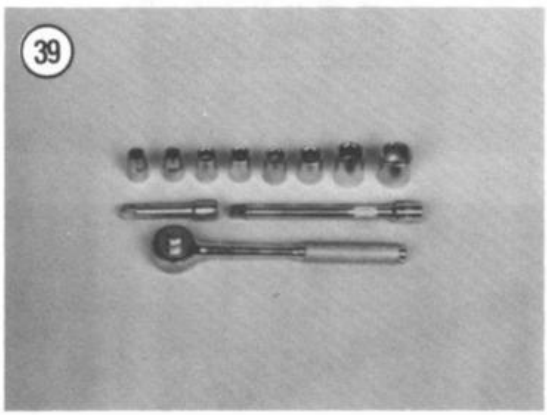
Open-end wrenches are speedy and work best in areas with limited overhead access. Their wide flat jaws make them unstable for situations where the bolt or nut is sunken in a well or close to the edge of

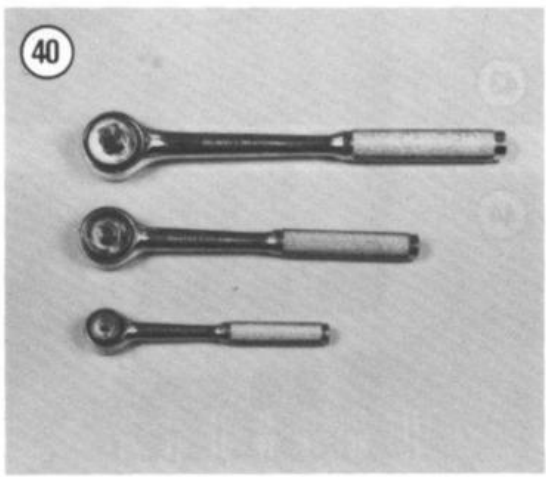


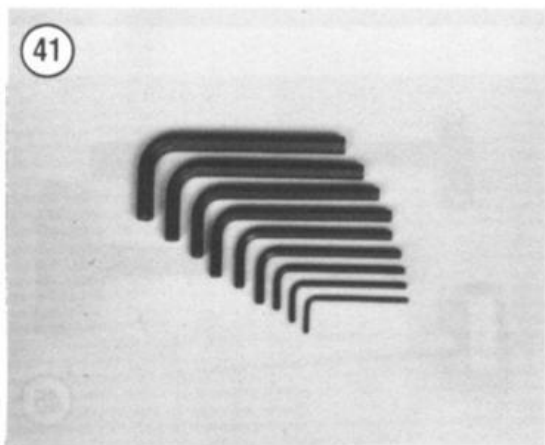


a casting. These wrenches grip only two flats of a fastener so if either the fastener head or the wrench jaws are worn, the wrench may slip off.

Combination wrenches (**Figure 37**) have open-end on one side and box-end on the other with both ends being the same size. These wrenches are favored by professionals because of their versatility.







Adjustable (Crescent) Wrenches

An adjustable wrench (sometimes called crescent wrench) can be adjusted to fit nearly any nut or bolt head which has clear access around its entire perimeter. Adjustable wrenches (**Figure 38**) are best used as a backup wrench to keep a large nut or bolt from turning while the other end is being loosened or tightened with a proper wrench.

Adjustable wrenches have only two gripping surfaces which make them more subject to slipping off the fastener and damaging the part and possibly injuring your hand. The fact that one jaw is adjustable only aggravates this shortcoming.

These wrenches are directional; the solid jaw must be the one transmitting the force. If you use the adjustable jaw to transmit the force, it will loosen and possibly slip off.

Adjustable wrenches come in all sizes but something in the 6 to 8 in. range is recommended as an all-purpose wrench.

Socket Wrenches

This type is undoubtedly the fastest, safest and most convenient to use. Sockets which attach to a ratchet handle (**Figure 39**) are available with 6-point or 12-point openings and 1/4, 3/8, 1/2 and 3/4 in. drives. The drive size indicates the size of the square hole which mates with the ratchet handle (**Figure 40**).

Several large sockets are required for the disassembly of the engine. These large sockets are not usually included in standard socket sets. These sizes are a must and are as follows:

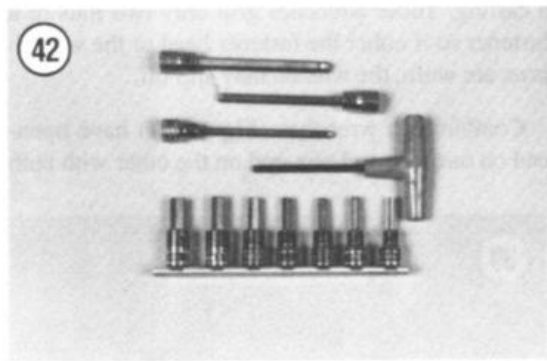
a. Balancer gear nut and clutch nut: 30 mm.

b. Primary gear nut: 36 mm.

Allen Wrenches

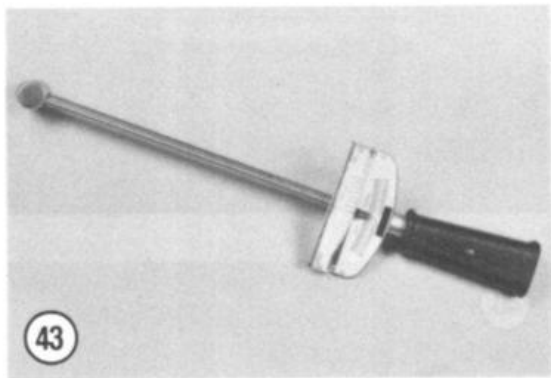
Allen wrenches (**Figure 41**) are available in sets or separately in a variety of sizes. These sets come in SAE and metric size, so be sure to buy a metric set. Allen bolts are sometimes called socket bolts. Sometimes the bolts are difficult to reach and it is suggested that a variety of Allen wrenches be pur-

chased (e.g. socket driven, T-handle and extension type) as shown in **Figure 42**.



Torque Wrench

A torque wrench is used with a socket to measure how tightly a nut or bolt is installed. They come in a wide price range and with either 3/8 or 1/2 in. square drive (**Figure 43**). The drive size indicates the size of the square drive which mates with the socket. Purchase one that measures 0-280 N•m (0-200 ft.-lb.).

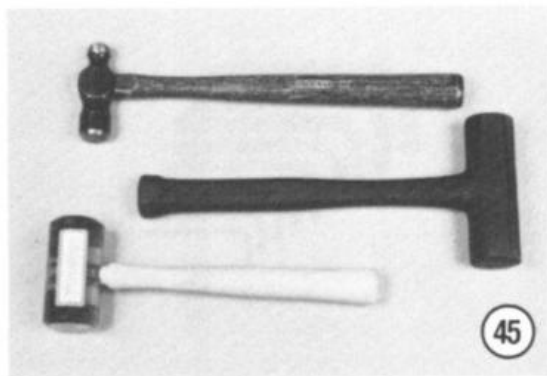


Impact Driver

This tool might have been designed with the bike in mind. This tool makes removal of fasteners easy and eliminates damage to bolts and screw slots. Impact drivers and interchangeable bits (**Figure 44**) are available at most large hardware, motorcycle or auto parts stores. Don't purchase a cheap one as they do not work as well and require more force (the "use a larger hammer" syndrome) than a moderately priced one. Sockets can also be used with a hand impact driver. However, make sure that the socket is designed for use with an impact driver or air tool. Do not use regular hand sockets, as they may shatter during use.

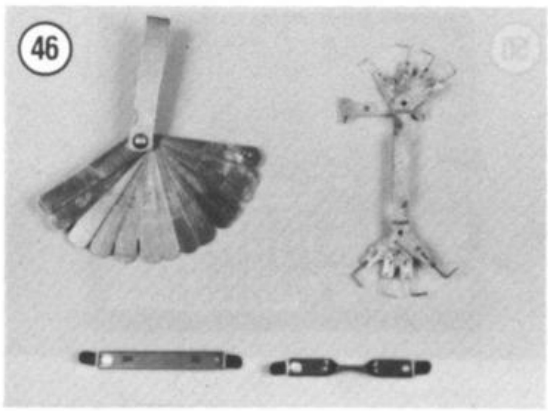
Hammers

The correct hammer (**Figure 45**) is necessary for repairs. Use only a hammer with a face (or head) of rubber or plastic or the soft-faced type that is filled with buckshot. These are sometimes necessary in engine teardowns. *Never* use a metal-faced hammer on engine or suspension parts, as severe damage will result in most cases. You can always produce the same amount of force with a soft-faced hammer. A metal-faced hammer, however, will be required when using an hand impact driver.

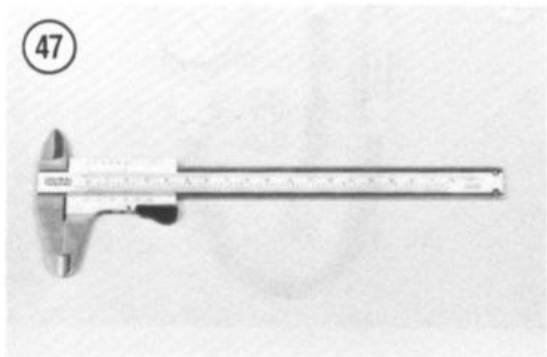


PRECISION MEASURING TOOLS

Measurement is an important part of motorcycle service. When performing many of the service procedures in this manual, you will be required to make a number of measurements. These include basic checks such as valve clearance, engine compression and spark plug gap. As you get deeper into engine disassembly and service, measurements will be re-

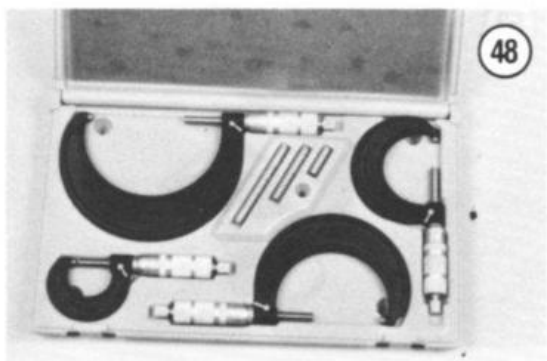


quired to determine the size and condition of the piston and cylinder bore, valve and guide wear, camshaft wear, crankshaft runout and so on. When making these measurements, the degree of accuracy will dictate which tool is required. Precision measuring tools are expensive. If this is your first experience at engine or suspension service, it may be more worthwhile to have the checks made at a Suzuki dealer or machine shop. However, as your skills and enthusiasm increase for doing your own service work, you may want to begin purchasing some of these specialized tools. The following is a description of the measuring tools required during engine and suspension overhaul.



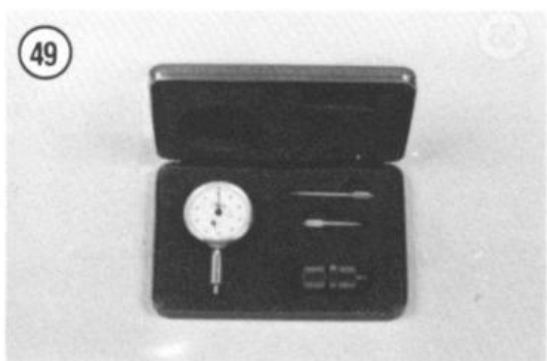
Feeler Gauge

Feeler gauges come in assorted sets and types (**Figure 46**). The feeler gauge is made of either a piece of a flat or round hardened steel of a specified thickness. Wire gauges are used to measure spark plug gap. Flat gauges are used for all other measurements. Feeler gauges are also designed for specialized uses, such as for measuring valve clearances. On these gauges, the gauge end is usually small enough and angled so as to make checking valve clearances easier.



Vernier Caliper

This tool (**Figure 47**) is invaluable when reading inside, outside and depth measurements to within close precision. It can be used to measure clutch spring length and the thickness of clutch plates, shims and thrust washers.



Outside Micrometers

One of the most reliable tools used for precision measurement is the outside micrometer (**Figure 48**). Outside micrometers will be required to measure valve shim thickness, piston diameter and valve stem diameter. Outside micrometers are also used with other tools to measure the cylinder bore and the valve guide inside diameters. Micrometers can be purchased individually or as a set.

Dial Indicator

Dial indicators (**Figure 49**) are precision tools used to check dimension variations on machined

parts such as transmission shafts and axles and to check crankshaft and axle shaft end play. Dial indicators are available with various dial types for different measuring requirements.

Cylinder Bore Gauge

The cylinder bore gauge is a very specialized precision tool. The gauge set shown in **Figure 50** is comprised of a dial indicator, handle and a number of length adapters to adapt the gauge to different bore sizes. The bore gauge can be used to make cylinder bore measurements such as bore size, taper and out-of-round. Depending on the bore gauge, it can sometimes be used to measure brake caliper and master cylinder bore sizes. An outside micrometer must be used together with the bore gauge to determine bore dimensions.

Small Hole Gauges

A set of small hole gauges allow you to measure a hole, groove or slot ranging in size up to 13 mm (0.500 in.). A small hole gauge will be required to measure valve guide, brake caliper and brake master cylinder bore diameters. An outside micrometer must be used together with the small hole gauge to determine bore dimensions.

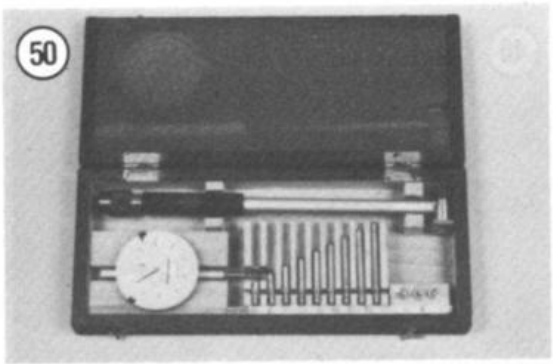
Compression Gauge

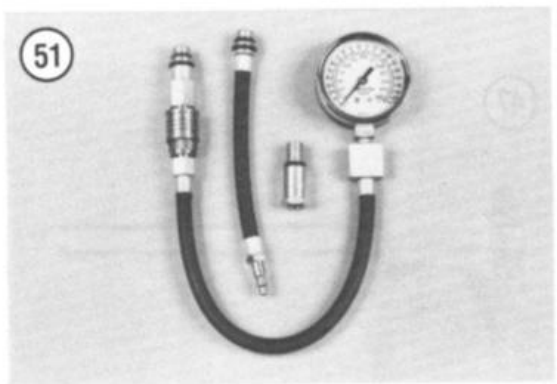
An engine with low compression cannot be properly tuned and will not develop full power. A compression gauge (**Figure 51**) measures engine compression. The one shown has a flexible stem with an extension that can allow you to hold it while kicking the engine over. Open the throttle all the way when checking engine compression. See Chapter Three.

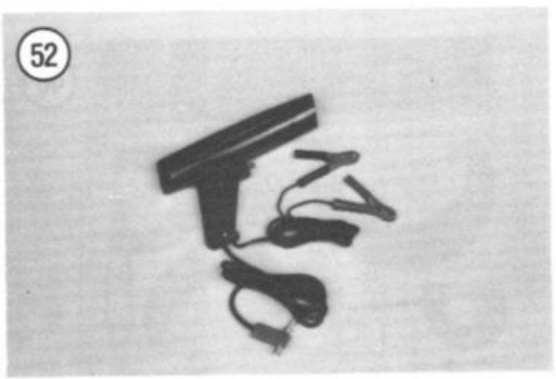
Strobe Timing Light

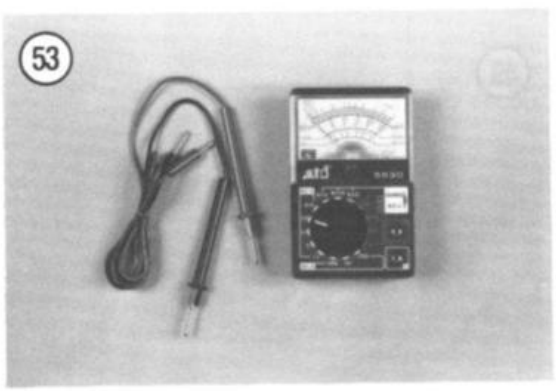
This instrument is useful for checking ignition timing. By flashing a light at the precise instant the spark plug fires, the position of the timing mark can be seen. The flashing light makes a moving mark appear to stand still opposite a stationary mark.

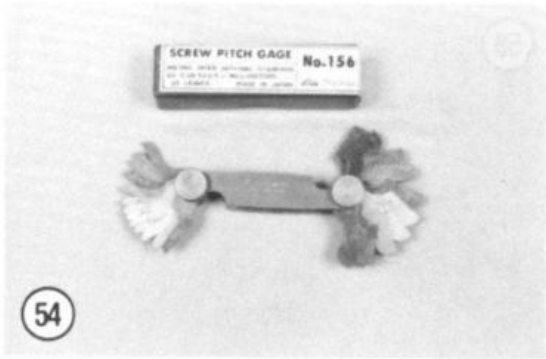
Suitable lights range from inexpensive neon bulb types to powerful xenon strobe lights (**Figure 52**). A light with an inductive pickup is recommended to











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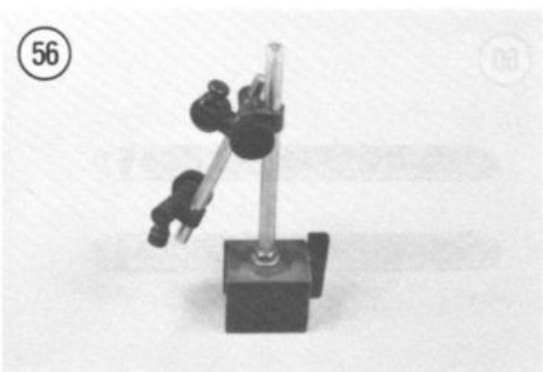

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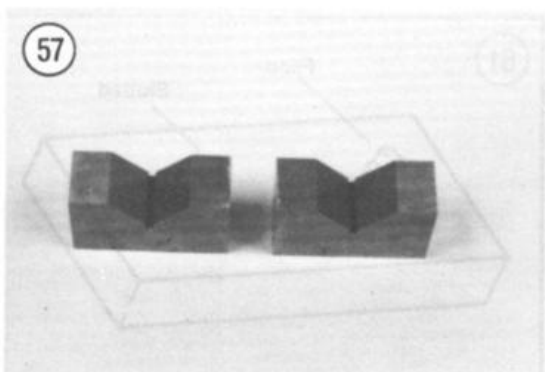

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eliminate any possible damage to ignition wiring. Use according to manufacturer's instructions.

Multimeter or VOM

This instrument (**Figure 53**) is invaluable for electrical system troubleshooting. See *Electrical Troubleshooting* in Chapter Nine for its use.

Screw Pitch Gauge

A screw pitch gauge (**Figure 54**) determines the thread pitch of bolts, screws, studs, etc. The gauge is made up of a number of thin plates. Each plate has a thread shape cut on one edge to match one thread pitch. When using a screw pitch gauge to determine a thread pitch size, try to fit different blade sizes onto the bolt thread until both threads match (**Figure 55**).

Magnetic Stand

A magnetic stand (**Figure 56**) is used to securely hold a dial indicator when checking the runout of a round object or when checking the end play of a shaft.

V-Blocks

V-blocks (**Figure 57**) are precision ground blocks used to hold a round object when checking its runout or condition. In motorcycle repair, V-blocks can be used when checking the runout of such items as valve stems, camshaft, balancer shaft, crankshaft, wheel axles and fork tubes.

SPECIAL TOOLS

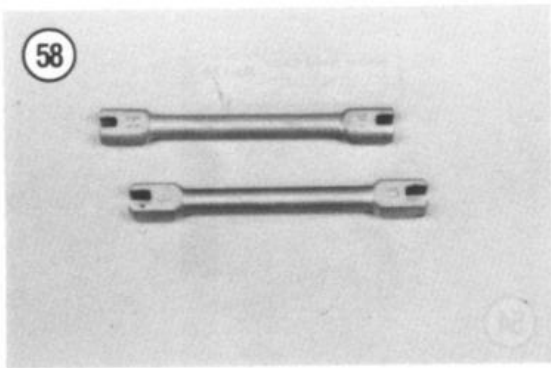
This section describes special tools unique to motorcycle service and repair.

Spoke Wrench

This special wrench is used to tighten wheel spokes (**Figure 58**). Always use the correct size wrench to avoid rounding out and damaging the spoke nipple.

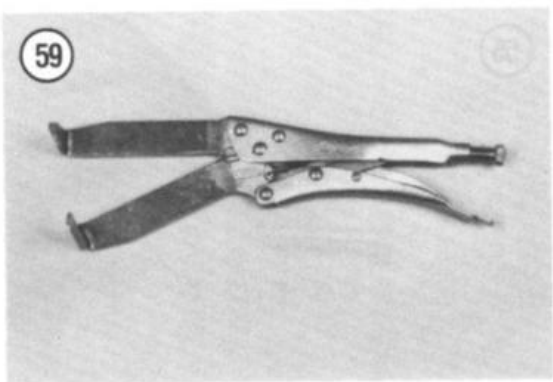
The Grabbit

The Grabbit (**Figure 59**) is a special tool used to hold the clutch boss when removing the clutch nut and to secure the drive sprocket when removing the sprocket nut.



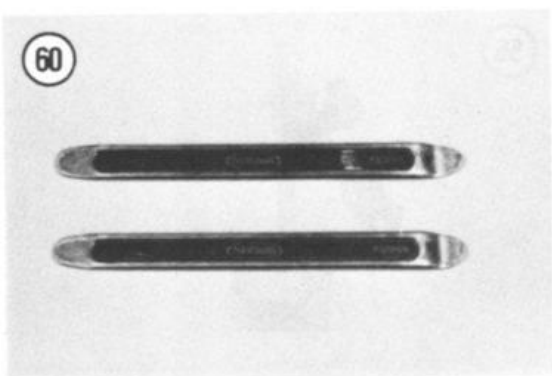
Tire Levers

When riding and maintaining a dual-purpose motorcycle, get use to changing tires. To avoid pinching tubes during tire changing, purchase a good set of tire levers (**Figure 60**). Never use a screwdriver in place of a tire lever; refer to Chapter Ten for its use. Before using a tire lever, check the working end of the tool and remove any burrs. Don't use a tire lever for prying anything but tires.



Flywheel Puller

A flywheel puller will be required whenever it is necessary to remove the rotor and service the stator plate assembly or when adjusting the ignition timing. In addition, when disassembling the engine, the rotor must be removed before the crankcases can be split. There is no satisfactory substitute for this tool. Because the rotor is a taper fit on the crankshaft, makeshift removal often results in crankshaft and rotor damage. Don't think about removing the rotor without this tool.



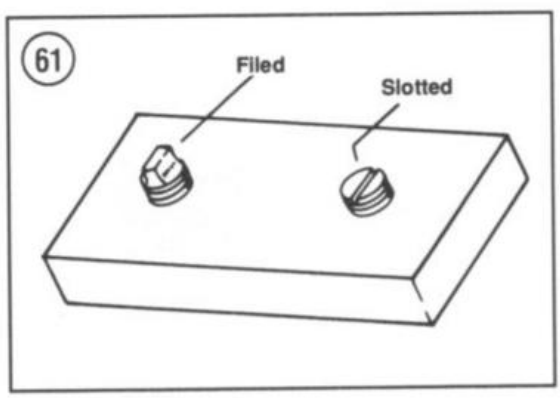
Special Tools

A few special tools may be required for major service. These are described in the appropriate chapters and are available either from a Suzuki dealer or other manufacturers as indicated.

MECHANIC'S TIPS

Removing Frozen Nuts and Screws

When a fastener rusts and cannot be removed, several methods may be used to loosen it. First, apply penetrating oil such as Liquid Wrench or WD-40 (available at hardware or auto supply stores). Apply it liberally and let it penetrate for 10-15 minutes. Rap the fastener several times with a small hammer; do not hit it hard enough to cause damage. Reapply the penetrating oil if necessary.



For frozen screws, apply penetrating oil as described, then insert a screwdriver in the slot and rap the top of the screwdriver with a hammer. This loosens the rust so the screw can be removed in the normal way. If the screw head is too chewed up to use this method, grip the head with vise-grip pliers and twist the screw out.

Avoid applying heat unless specifically instructed, as it may melt, warp or remove the temper from parts.

Removing Broken Screws or Bolts

When the head breaks off a screw or bolt, several methods are available for removing the remaining portion.

If a large portion of the remainder projects out, try gripping it with vise-grip pliers. If the projecting portion is too small, file it to fit a wrench or cut a slot in it to fit a screwdriver. See **Figure 61**.

If the head breaks off flush, use a screw extractor. To do this, centerpunch the exact center of the remaining portion of the screw or bolt. Drill a small hole in the screw and tap the extractor into the hole. Back the screw out with a wrench on the extractor. See **Figure 62**.

Remedying Stripped Threads

Occasionally, threads are stripped through carelessness or impact damage. Often the threads can be

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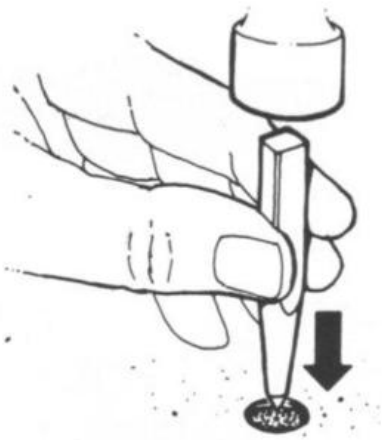
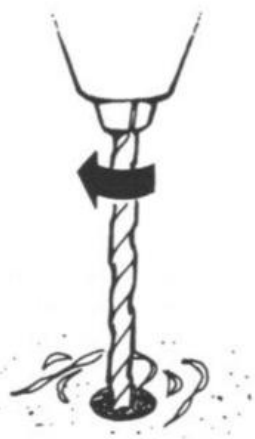
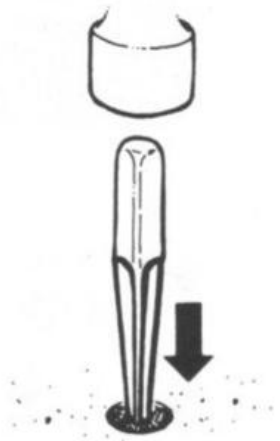
REMOVING BROKEN SCREWS AND BOLTS



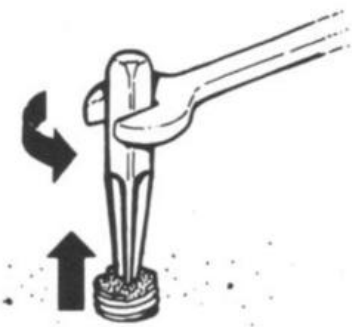
1. Center punch broken stud



2. Drill hole in stud



3. Tap in screw extractor



4. Remove broken stud

cleaned up by running a tap (for internal threads on nuts) or die (for external threads on bolts) through the threads. See **Figure 63**. To clean or repair spark plug threads, a spark plug tap can be used (**Figure 64**).

NOTE

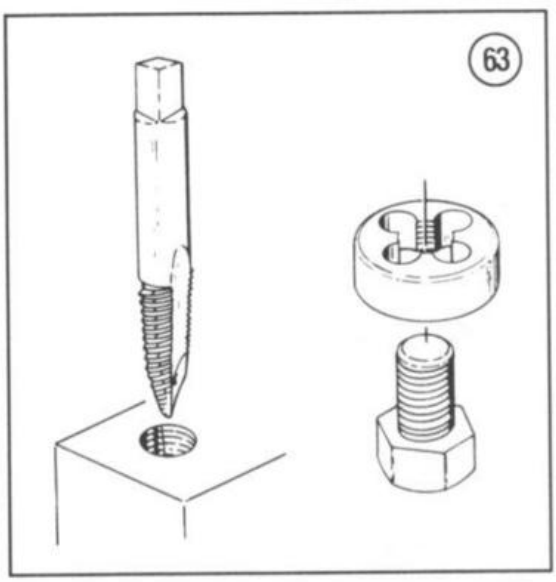
Tap and dies can be purchased individually or in a set as shown in ***Figure 65****.*

If an internal thread is damaged, it may be necessary to install a Helicoil (**Figure 66**) or some other type of thread insert. Follow the manufacturer's instructions when installing their insert.

RIDING SAFETY

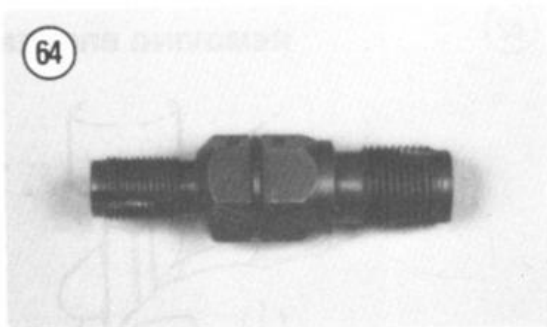
General Tips

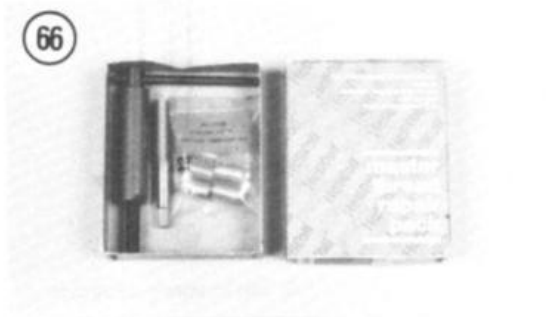
1. Read your owner's manual and know your machine.
2. Check the throttle and brake controls before starting the engine.
3. Know how to make an emergency stop.
4. Never add fuel while anyone is smoking in the area or when the engine is running.
5. Never wear loose scarves, belts or boot laces that could catch on moving parts.
6. Always wear eye and head protection and protective clothing to protect your *entire* body. Today's riding apparel is very stylish and you will be ready for action as well as being well protected.



7. Riding in the winter months requires a good set of clothes to keep your body dry and warm, otherwise your entire trip may be miserable. If you dress properly, moisture will evaporate from your body. If you become too hot and if your clothes trap the moisture, you will become cold. Even mild temperatures can be very uncomfortable and dangerous when combined with a strong wind or traveling at high speed. See **Table 5** for wind chill factors. Always dress according to what the wind chill factor is, not the ambient temperature.

8. Never allow anyone to operate the bike wihout proper instruction. This is for their bodily protection and to keep your machine from damage or destruction.





9. Use the "buddy system" for long trips, just in case you have a problem or run out of gas.
10. Never attempt to repair your machine with the engine running except when necessary for certain tune-up procedures.
11. Check all of the machine components and hardware frequently, especially the wheels and the steering.

Operating Tips

1. Avoid dangerous terrain.
2. Keep the headlight, turn signal lights (models so equipped) and taillight free of dirt.
3. Always steer with both hands.
4. Be aware of the terrain and avoid operating the bike at excessive speed.
5. Do not panic if the throttle sticks. Turn the engine stop switch to the OFF position.
6. Do not tailgate. Rear end collisions can cause injury and machine damage.
7. Do not mix alcoholic beverages or drugs with riding—*ride straight.*
8. Check your fuel supply regularly. Do not travel farther than your fuel supply will permit you to arrive at the next fuel stop.

Table 1 FRAME SERIAL NUMBERS

U.S. Models	
Model year and number	**Frame serial No. start to end**
1990	
DR250L	JS1DJ42A-L21000001 to *
DR250SL	JS1SJ44A-L21000001 to *
DR350L	JS1DJ41A-L21000001 to *
DR350SL	JS1SK42A-L21000001 to *
1991	
DR250M	JS1DJ42A-M21000001 to *
DR250SM	JS1SJ44A-M21000001 to *
DR350M	JS1DJ41A-M21000001 to *
DR350SM	JS1SK42A-M21000001 to *
1992	
DR250N	JS1DJ42A-N21000001 to *
DR250SN	JS1SJ44A-N21000001 to *
DR350N	JS1DJ41A-N21000001 to *
DR350SN	JS1SK42A-N21000001 to *
1993	
DR250P	JS1DJ42A-P21000001 to *
DR250SP	JS1SJ44A-P21000001 to *
DR350P	JS1DJ41A-P21000001 to *
DR350SP	JS1SK42A-P21000001 to *
1994	
DR250SR	N.A.
DR350R	N.A.
DR350SR	N.A.
U.K. Models	
Model year and number	**Frame serial No. start to end**
1990	
DR350L	N.A.
DR350SL	SK42A-100031 to *
1991	
DR350M	N.A.
DR350SM	SK42A-101880 to *
1992	
DR350N	N.A.
DR350SN	SK42A-105876 to *

(continued)

Table 1 FRAME SERIAL NUMBERS (continued)

Model year and number	U.K. Models Frame serial No. start to end
1993	
DR350P	N.A.
DR350SP	SK42A-108839 to *
1994	
DR350R	N.A.
DR350SR	N.A.

* Not specified.
N.A. Not available

Table 2 DECIMAL AND METRIC EQUIVALENTS

Fractions	Decimal in.	Metric mm	Fractions	Decimal in.	Metric mm
1/64	0.015625	0.39688	33/64	0.515625	13.09687
1/32	0.03125	0.79375	17/32	0.53125	13.49375
3/64	0.046875	1.19062	35/64	0.546875	13.89062
1/16	0.0625	1.58750	9/16	0.5625	14.28750
5/64	0.078125	1.98437	37/64	0.578125	14.68437
3/32	0.09375	2.38125	19/32	0.59375	15.08125
7/64	0.109375	2.77812	39/64	0.609375	15.47812
1/8	0.125	3.1750	5/8	0.625	15.87500
9/64	0.140625	3.57187	41/64	0.640625	16.27187
5/32	0.15625	3.96875	21/32	0.65625	16.66875
11/64	0.171875	4.36562	43/64	0.671875	17.06562
3/16	0.1875	4.76250	11/16	0.6875	17.46250
13/64	0.203125	5.15937	45/64	0.703125	17.85937
7/32	0.21875	5.55625	23/32	0.71875	18.25625
15/64	0.234375	5.95312	47/64	0.734375	18.65312
1/4	0.250	6.35000	3/4	0.750	19.05000
17/64	0.265625	6.74687	49/64	0.765625	19.44687
9/32	0.28125	7.14375	25/32	0.78125	19.84375
19/64	0.296875	7.54062	51/64	0.796875	20.24062
5/16	0.3125	7.93750	13/16	0.8125	20.63750
21/64	0.328125	8.33437	53/64	0.828125	21.03437
11/32	0.34375	8.73125	27/32	0.84375	21.43125
23/64	0.359375	9.12812	55/64	0.859375	21.82812
3/8	0.375	9.52500	7/8	0.875	22.22500
25/64	0.390625	9.92187	57/64	0.890625	22.62187
13/32	0.40625	10.31875	29/32	0.90625	23.01875
27/64	0.421875	10.71562	59/64	0.921875	23.41562
7/16	0.4375	11.11250	15/16	0.9375	23.81250
29/64	0.453125	11.50937	61/64	0.953125	24.20937
15/32	0.46875	11.90625	31/32	0.96875	24.60625
31/64	0.484375	12.30312	63/64	0.984375	25.00312
1/2	0.500	12.70000	1	1.00	25.40000

Table 3 GENERAL TIGHTENING TORQUES*

Nut	Bolt	ft.-lb.	N·m
10 mm	6 mm	4.5	6
12 mm	8 mm	11	15
14 mm	10 mm	22	30
17 mm	12 mm	40	55
19 mm	14 mm	61	85
22 mm	16 mm	94	130

*This table lists general torque for standard fasteners with standard I.S.O. pitch threads.

Table 4 WORKSHOP TOOLS

Tool	Size or specification
Screwdriver	
Common	1/8 × 4 in. blade
Common	5/16 × 8 in. blade
Common	3/8 × 12 in. blade
Phillips	Size 2 tip, 6 in. overall
Pliers	
Slip joint	6 in. overall
Vise-grip	10 in. overall
Needlenose	6 in. overall
Channel lock	12 in. overall
Snap ring	Assorted
Wrenches	
Box-end set	Assorted
Open-end set	Assorted
Crescent	6 in. and 12 in. overall
Socket set	1/2 in. drive ratchet with assorted metric sockets
Socket drive extensions	1/2 in. drive, 2 in., 4 in. and 6 in.
Socket universal joint	1/2 in. drive
Allen	Socket driven (long and short), T-handle driven and 90°
Hammers	
Soft-faced	—
Plastic-faced	—
Metal-faced	—
Other special tools	
Impact driver	1/2 in. drive with assorted bits
Torque wrench	1/2 in. driver (ft.-lb.)
Flat feeler gauge	Metric set

Table 5 WINDCHILL FACTOR

Estimated wind speed in mph	Actual thermometer reading (°F)											
	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
	Equivalent temperature (°F)											
Calm	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
5	48	37	27	16	6	−5	−15	−26	−36	−47	−57	−68
10	40	28	16	4	−9	−21	−33	−46	−58	−70	−83	−95
15	36	22	9	−5	−18	−36	−45	−58	−72	−85	−99	−112
20	32	18	4	−10	−25	−39	−53	−67	−82	−96	−110	−124
25	30	16	0	−15	−29	−44	−59	−74	−88	−104	−118	−133
30	28	13	−2	−18	−33	−48	−63	−79	−94	−109	−125	−140
35	27	11	−4	−20	−35	−49	−67	−82	−98	−113	−129	−145
40	26	10	−6	−21	−37	−53	−69	−85	−100	−116	−132	−148
*	Little danger (for properly clotherd person)				Increasing danger			Great danger				
					• Danger from freezing of exposed flesh •							

*Wind speeds greater than 40 mph have little additional effect.

CHAPTER TWO

TROUBLESHOOTING

Diagnosing mechanical problems is relatively simple if you use orderly procedures and keep a few basic principles in mind. The first step in any troubleshooting procedure is to define the symptoms as closely as possible and then localize the problem. Subsequent steps involve testing and analyzing those areas which could cause the symptoms. A haphazard approach may eventually solve the problem, but it can be very costly in terms of wasted time and unnecessary parts replacement.

Proper lubrication, maintenance and periodic tune-ups as described in Chapter Three will reduce the necessity for troubleshooting. Even with the best of care, however, a dual-purpose motorcycle is prone to problems which will require troubleshooting.

Never assume anything. Do not overlook the obvious. If you are riding along and the engine suddenly quits, check the easiest, most accessible problem spots first. Is there gasoline in the tank? Is the fuel shutoff valve in the ON position? Has the spark plug wire fallen off?

If nothing obvious turns up in a quick check, look a little further. Learning to recognize and describe symptoms will make repairs easier for you or a mechanic at the shop. Describe problems accurately and fully. Saying that "it won't run" isn't the same thing as saying "it quit climbing a hill and won't start," or that "it sat in my garage for three months and then wouldn't start."

Gather as many symptoms as possible to aid in diagnosis. Note whether the engine lost power gradually or all at once, what color smoke came from the exhaust and so on. Remember that the more complicated a machine is, the easier it is to troubleshoot because symptoms point to specific problems.

After the symptoms are defined, areas which could cause problems are tested and analyzed. Guessing at the cause of a problem may provide the solution, but it can easily lead to frustration, wasted time and a series of expensive, unnecessary parts replacements.

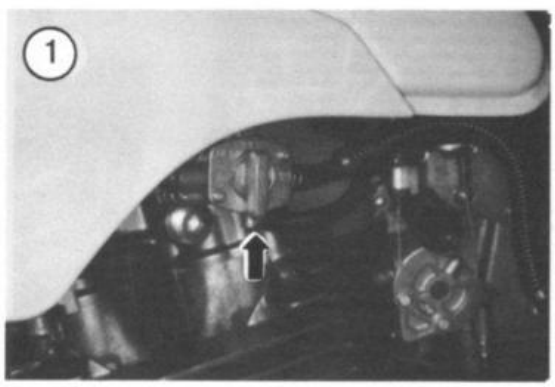
You do not need fancy equipment or complicated test gear to determine whether repairs can be attempted at home. A few simple checks could save a large repair bill and lost time while the bike sits in a

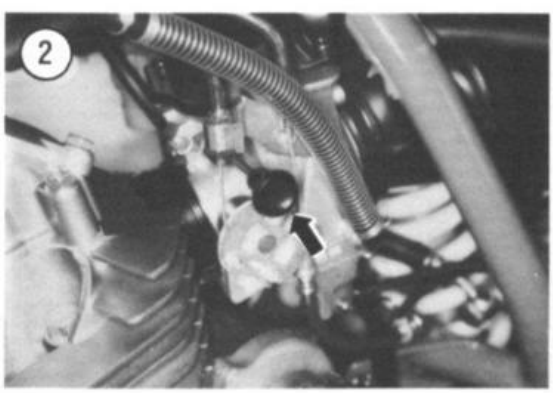
dealer's service department. On the other hand, be realistic and do not attempt repairs beyond your abilities. Service departments tend to charge heavily for putting together a disassembled engine that may have been abused. Some won't even take on such a job—so use common sense, don't get in over your head.

OPERATING REQUIREMENTS

An engine needs 3 basics to run properly: correct fuel/air mixture, compression and a spark at the right time. If one basic requirement is missing, the engine will not run. Four-stroke engine operating principles are described in Chapter Four under *Engine Principles*. The ignition system is the weakest link of the 3 basics. More problems result from ignition breakdowns than from any other source. Keep that in mind before you begin tampering with carburetor adjustments and the like.

If a bike has been sitting for any length of time and refuses to start, check and clean the spark plug. Check the condition of the battery to make sure it has an adequate charge. If these are okay, then look to the gasoline delivery system. This includes the tank, fuel shutoff valve and fuel line to the carburetor. If your bike has a steel tank, rust may have formed in the tank, obstructing fuel flow. Gasoline deposits may have gummed up carburetor jets and air passages. Gasoline tends to lose its potency after standing for long periods. Condensation may contaminate it with water. Drain the old gas and try starting with a fresh tankful.





TROUBLESHOOTING INSTRUMENTS

Refer to Chapter One for a list of the instruments needed.

STARTING THE ENGINE

When your engine refuses to start, frustration can cause you to forget basic starting principles and procedures. The following outline will guide you through basic starting procedures.

NOTE
The off road models, DR250 and DR350, are not equipped with the sidestand switch nor the neutral switch.

An ignition control system is installed on all DR250S and DR350S models and it consists of a CDI unit, a neutral indicator light, a neutral switch and a sidestand switch. When the ignition switch and the engine stop switch are ON, the ignition will produce a spark for starting *only* if the following conditions exist:

a. The sidestand is up (the sidestand switch is ON). The engine will start if the transmission is in gear and the clutch lever is pulled in.
b. The transmission is in neutral (the neutral switch is ON).

Always allow the engine to sufficiently warm up before riding off. Do not rev or accelerate hard with a cold engine as this may cause premature engine wear.

Starting a Cold Engine

1. Shift the transmission into NEUTRAL.
2. Turn the fuel valve to the ON position (**Figure 1**).
3. Pull the choke knob all the way out (**Figure 2**).
4. Turn the ignition key to ON.

5. Turn the engine stop switch to the RUN position (**Figure 3**). Position the sidestand up.
6. With the throttle completely *closed*, kick the engine over with the kickstarter or press the start button.
7. When the engine starts, work the throttle slightly to keep it running.
8. Idle the engine approximately for a minute or until the throttle responds cleanly and the choke can be closed.

Starting a Warm or Hot Engine

1. Shift the transmission into NEUTRAL.
2. Turn the fuel valve to the ON position (**Figure 1**).
3. Make sure the choke is closed. The choke knob should be pushed in toward the carburetor (**Figure 4**) for a warm engine.
4. Turn the ignition key to ON and the engine stop switch to the RUN position (**Figure 3**). Position the sidestand up.
5. Open the throttle slightly and kick the engine over or press the start button. If the engine does not start, try again with the throttle opened approximately 1/4 to 1/2.

Starting a Flooded Engine

If the engine is flooded, open the throttle all the way and kick, or turn, the engine over until it starts.

NOTE

If the engine refuses to start, check the carburetor overflow hose attached to the fitting at the bottom of the float bowl. If fuel is running out of the hose, the float may be stuck open.

STARTING DIFFICULTIES

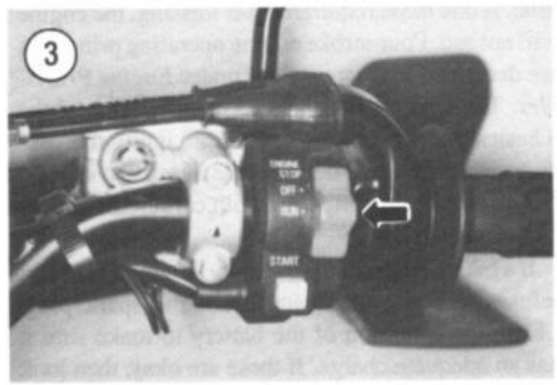
When the bike is difficult to start, or won't start at all, it does not help to kick away at the kick starter. Check for obvious problems even before getting out your tools. Go down the following list step-by-step. Do each one. If the bike still will not start, refer to the appropriate troubleshooting procedures which follow in this chapter.

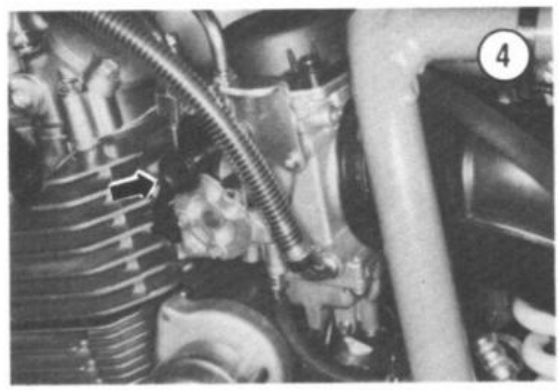
1. Is there fuel in the tank? Remove the fuel filler cap (**Figure 5**) and rock the bike from side to side. Listen for fuel sloshing around.

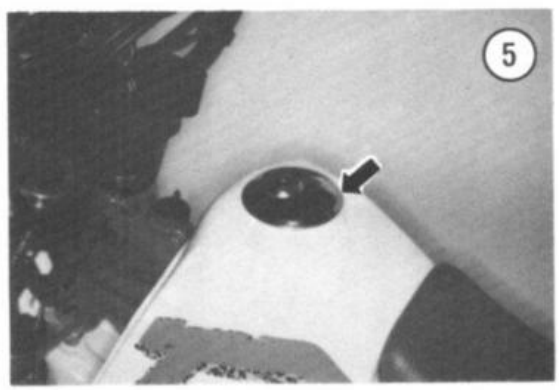
WARNING

Do not use an open flame to check in the tank. A serious explosion is certain to result.

2. On off road models, DR250 and DR350 models, make sure the fuel tank cap vent line is not kinked or pinched.
3. If there is fuel in the tank, pull off the fuel line at the carburetor. Turn the fuel valve to RES (**Figure 6**) and see if fuel flows freely. If none comes out and





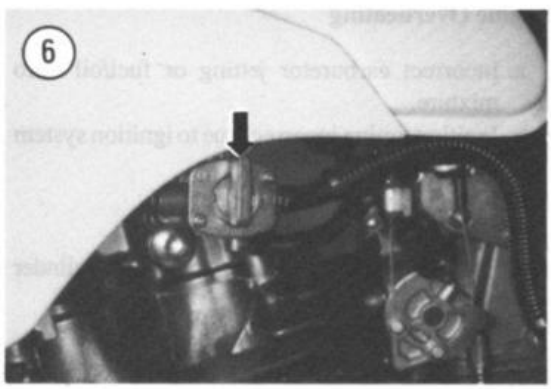


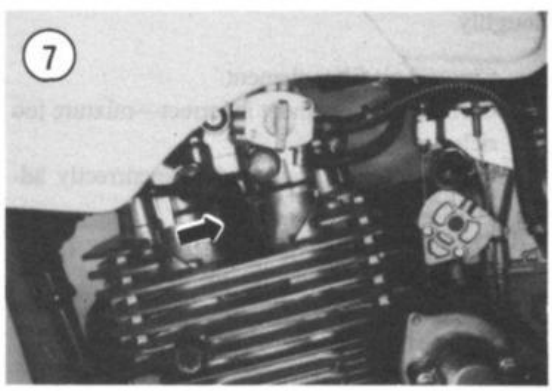
there is a fuel filter installed in the fuel line, remove the filter and turn the fuel valve to RES again. If fuel flows, the filter is clogged and should be replaced. If no fuel comes out, the fuel valve may be shut off, blocked by foreign matter, or the fuel cap vent may be plugged. If the carburetor is getting usable fuel, turn to the compression next.

NOTE

All DR250S and DR350S models sold in California are equipped with an evaporative emission control system. On these models, the fuel filler cap is not vented. Instead of checking the fuel cap, check the carbon canister hoses for bending, kinks or other damage. Refer to ***Emission Control*** *in Chapter Eight.*

4. If the engine is getting fuel, kick the kickstarter or press the start button, normally and observe its operation. If the kickstarter feels normal (adequate engine compression), proceed to Step 5. However if the kick starter operation feels unusually light or heavy, perform a compression test.





5. Check that the engine stop switch (**Figure 3**) is in the RUN position. If necessary, test the switch as described under *Switches* in Chapter Nine.

6. Is the spark plug wire on tight (**Figure 7**). Push it on and slightly rotate it to clean the electrical connection between the plug and the connector.

7. Is the choke lever in the correct position? Refer to *Starting the Engine* in this chapter.

ENGINE STARTING TROUBLES

An engine that refuses to start or is difficult to start is very frustrating. More often than not, the problem is very minor and can be found with a simple and logical troubleshooting approach.

The following items show a beginning point from which to isolate engine starting problems.

Engine Fails to Start

Perform the following spark test to determine if the ignition system is operating properly.

CAUTION

Before removing the spark plug in Step 1, clean all dirt and debris from the plug base. Dirt that falls into the cylinder will cause rapid piston, piston ring and cylinder wear.

NOTE

If you are checking the spark plug while on the trail, more than likely there is dirt clogged underneath the fuel tank. When the spark plug is removed, dirt could fall from the tank and into the cylinder. If you do not have time to remove the fuel tank, wrap a large clean cloth or riding jacket around the fuel tank, especially on the left-hand side. Then remove the spark plug and check or replace it as required. Remove the cloth after reinstalling the spark plug.

1. Remove the spark plug.(**Figure 7**).

2. Connect the spark plug wire and connector to the spark plug and touch the spark plug base to the cylinder head to ground it. Position the spark plug so you can see the electrode.

3. Turn the ignition key to ON and the engine stop switch to RUN.

4. Kick the engine over with the kickstarter, or press the start button. A fat blue spark should be evident across the spark plug electrode.

WARNING

Do not hold the spark plug, wire or connector or a serious electrical shock may result. If it is necessary to hold the high voltage lead, do so with an insulated pair of pliers. The high voltage generated by the ignition system could produce serious or fatal shocks.

5. If the spark is good, check for one or more of the following possible malfunctions:
   a. Obstructed fuel line or fuel filter.
   b. Leaking head or cylinder base gasket.
6. If spark is not good, check for one or more of the following:
   a. Weak ignition coil.
   b. Weak CDI unit.
   c. Loose electrical connections.
   d. Dirty electrical connections.
   e. Loose or broken ignition coil ground wire.

Engine is Difficult to Start

Check for one or more of the following possible malfunctions:
   a. Fouled spark plug.
   b. Improperly operating choke.
   c. Contaminated fuel system.
   d. Improperly adjusted carburetor.
   e. Loose electrical connections.
   f. Dirty electrical connections.
   g. Weak CDI unit.
   h. Weak ignition coil.
   i. Poor compression.

Engine Will Not Crank

If the engine will not crank because of a mechanical problem, check for one or more of the following possible malfunctions.
   a. Defective kickstarter and/or gear.
   b. Battery needs recharging (electric start models).
   c. Seized piston.
   d. Seized crankshaft bearings.
   e. Broken connecting rod.

ENGINE PERFORMANCE

In the following check list, it is assumed that the engine runs, but is not operating at peak performance. This will serve as a starting point from which to isolate a performance malfunction.

The possible causes for each malfunction are listed in a logical sequence and in order of probability.

Engine Will Not Idle

   a. Carburetor incorrectly adjusted.
   b. Pilot jet clogged.
   c. Obstructed fuel line or fuel shutoff valve.
   d. Fouled or improperly gapped spark plug.

Engine Misses at High Speed

   a. Fouled or improperly gapped spark plug.
   b. Improper carburetor main jet selection.
   c. Carburetor main jet and/or needle jet clogged.
   d. Obstructed fuel line or fuel shutoff valve.
   e. Ignition timing incorrect due to ignition system malfunction.

Engine Overheating

   a. Incorrect carburetor jetting or fuel/oil ratio mixture.
   b. Ignition timing incorrect due to ignition system malfunction.
   c. Improper spark plug heat range.
   d. Intake system air leak.
   e. Damaged or blocked cooling fins on cylinder and/or cylinder head.
   f. Dragging brake(s).

Excessive Exhaust Smoke and Engine Runs Roughly

   a. Clogged air filter element.
   b. Carburetor adjustment incorrect—mixture too rich.
   c. Carburetor float damaged or incorrectly adjusted.
   d. Choke not operating correctly.
   e. Water or other contaminants in fuel.
   f. Clogged fuel line.
   g. Excessive piston-to-cylinder clearance.
   h. Valve component wear.

Engine Loses Power

a. Carburetor incorrectly adjusted.
b. Engine overheating.
c. Ignition timing incorrect due to ignition system malfunction.
d. Incorrectly gapped spark plug.
e. Obstructed muffler.
f. Dragging brake(s).

Engine Lacks Acceleration

a. Carburetor adjustment incorrect.
b. Clogged fuel line.
c. Ignition timing incorrect due to ignition system malfunction.
d. Dragging brake(s).

ENGINE NOISES

1. *Knocking or pinging during acceleration*—Caused by using a lower octane fuel than recommended. May also be caused by poor fuel available at some "discount" gasoline stations. Pinging can also be caused by a spark plug of the wrong heat range and incorrect carburetor jetting. Refer to *Correct Spark Plug Heat Range* in Chapter Three.
2. *Slapping or rattling noises at low speed or during acceleration*—May be caused by piston slap, i.e., excessive piston-cylinder wall clearance.
3. *Knocking or rapping while decelerating*—Usually caused by excessive rod bearing clearance.
4. *Persistent knocking and vibration*—Usually caused by worn main bearings.
5. *Rapid on-off squeal*—Compression leak around cylinder head gasket or spark plug.

EXCESSIVE VIBRATION

This can be difficult to find without disassembling the engine. Usually this is caused by loose engine or suspension mounting hardware.

CLUTCH

The three basic clutch troubles are:
a. Clutch noise.
b. Clutch slipping.
c. Improper clutch disengagement.

All clutch troubles, except adjustments, require partial engine disassembly to identify and cure the problem. Refer to Chapter Six for procedures.

The troubleshooting procedures outlined in **Figure 8** will help you solve the majority of clutch troubles in a systematic manner.

TRANSMISSION

The basic transmission troubles are:
a. Excessive gear noise.
b. Difficult shifting.
c. Gears pop out of mesh.
d. Incorrect shift lever operation.

Transmission symptoms are sometimes hard to distinguish from clutch symptoms. Be sure that the clutch is not causing the trouble before working on the transmission.

The troubleshooting procedures outlined in **Figure 9** will help you solve the majority of transmission troubles.

IGNITION SYSTEM

All DR Series models are equipped with a capacitor discharge ignition (CDI) system. This solid state system uses no contact breaker point or other moving parts. Because of the solid state design, problems with the capacitor discharge system are relatively few. However, when problems arise they stem from one of the following:

a. Weak spark.
b. No spark.

It is possible to check CDI systems that:

a. Do not spark.
b. Have broken or damaged wires.

It is difficult to check CDI systems that malfunction due to:

a. Vibration problems.
b. Components that malfunction only when the engine is hot or under a load.

1. Disconnect the engine kill switch (**Figure 3**) electrical connector and see if the problem still exists.
2. Make sure that the stator plate and pickup coil (**Figure 10**) mounting screws are tight. If the screws are loose, recheck the ignition timing as described in Chapter Three.
3. Remove the fuel tank (Chapter Eight) and remove the tape on all electrical connectors. Make sure the

8 CLUTCH TROUBLESHOOTING

Clutch slipping	Check: • Incorrect clutch adjustment • Weak clutch springs • Worn clutch plates • Damaged pressure plates • Clutch release mechanism damage
Clutch dragging	Check: • Incorrect clutch adjustment • Clutch spring tension uneven • Warped clutch discs • Excessive clutch lever play • Clutch housing damage
Excessive clutch noise	Check: • Damaged clutch gear teeth • Worn or warped clutch plates

9 TRANSMISSION TROUBLESHOOTING

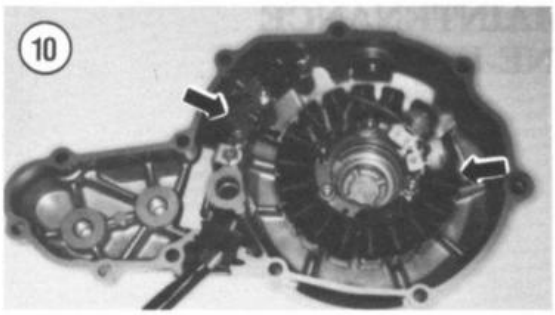
Excessive gear noise	Check: • Worn bearings • Worn or damaged gears • Excessive gear backlash
Difficult shifting	Check: • Damaged gears • Damaged shift forks • Damaged shift drum • Damaged shift lever assembly • Incorrect main shaft and countershaft engagement

(continued)

connectors are connected properly. If necessary, clean the connectors with electrical contact cleaner and wipe clean.

4. Check the stator and pickup coils for cracks or damage that would cause the coils to be out of alignment.

5. If you cannot locate the problem, refer to *Ignition System Troubleshooting* in Chapter Nine.



FRONT SUSPENSION AND STEERING

Poor handling may be caused by improper front or rear tire pressure, a damaged or bent frame or front steering components, worn swing arm bushings, worn wheel bearings or dragging brakes.

BRAKES

Disc Brake

The front and rear disc brakes are critical to riding performance and safety. It should be inspected frequently and any problems located and repaired immediately. When replacing or refilling the brake fluid, use only DOT 4 brake fluid from a closed and sealed container. See Chapter Twelve for additional information on brake fluid and disc brake service.

9 (continued) **TRANSMISSION TROUBLESHOOTING (continued)**

Gears pop out of mesh	Check: • Worn gear or transmission shaft splines • Shift forks worn or bent • Worn dog holes in gears • Insufficient shift lever spring tension • Damaged shift lever linkage
Incorrect shift lever operation	Check: • Bent shift lever • Bent or damaged shift lever shaft
Incorrect shifting after engine reassembly	Check: • Missing transmission shaft shims • Incorrectly installed parts • Shift forks bent during reassembly • Incorrectly assembled transmission • Incorrect clutch adjustment • Incorrectly assembled shift linkage assembly

CHAPTER THREE

LUBRICATION, MAINTENANCE AND TUNE-UP

Your Suzuki DR should be cared for by two methods: preventive and corrective maintenance. Because a motorcycle is subjected to tremendous heat, stress and vibration—even in normal use—preventive maintenance prevents costly and unexpected corrective maintenance. When neglected, any bike becomes unreliable and actually dangerous to ride. When properly maintained, your Suzuki is one of the most reliable bikes available and will give many miles and years of dependable and safe riding. By maintaining a routine service schedule as described in this chapter, costly mechanical problems and unexpected breakdowns can be prevented.

The procedures presented in this chapter can be easily performed by anyone with average mechanical skills. **Table 1** is a suggested factory maintenance schedule. **Tables 1-6** are located at the end of this chapter.

PRE-CHECKS

The following checks should be performed prior to the first ride of the day.

1. Inspect the fuel line and fittings for wetness.
2. Make sure the fuel tank is full of fresh gasoline.
3. Make sure the air filter element is clean and that the cover is securely in place.

CAUTION

*Do **not** check the oil level on a cold engine as you will get an incorrect oil level reading on the dipstick indicating that the oil level is low. You may add additional oil that is **not** required.*

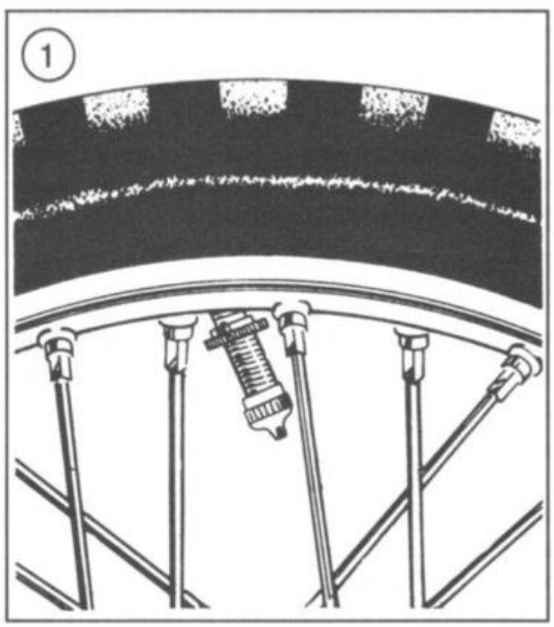
4. *After the engine has been warmed up*, check the engine oil level in the frame oil tank as described in this chapter.
5. Check the operation of the clutch and adjust if necessary.
6. Check that the clutch and brake levers operate properly with no binding.
7. Check the hydraulic fluid level in the front and rear master cylinder reservoirs. Add DOT 4 brake fluid if necessary.
8. Inspect the condition of the front and rear suspension. Make sure it has a good solid feel with no looseness.

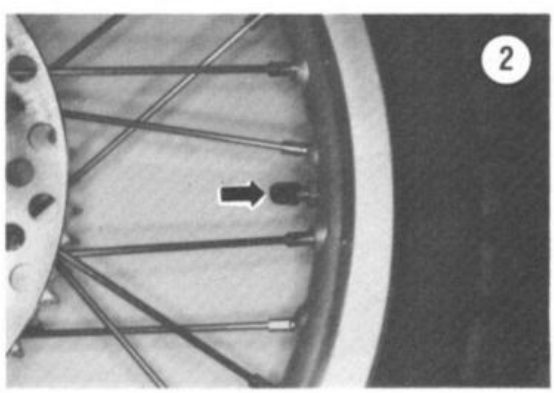
9. Check the drive chain for wear and correct tension.
10. Check tire pressure, refer to **Table 2**.

NOTE

While checking tire pressure, also check the position of the valve stem. If the valve stem is cocked sideways like that shown in ***Figure 1****, your riding time could end quickly because of a flat tire. Refer to* ***Tires and Wheels*** *in this chapter.*

11. Check the exhaust system for leakage or damage.
12. Check the tightness of all fasteners, especially engine and suspension mounting hardware.
13. Check the rear driven sprocket and bolts as follows:





a. Check the sprocket holes for signs of egg-shaping. If the sprocket is found in this condition, the sprocket bolts have loosened during riding. If wear is severe, it is suggested that you replace the sprocket before the hub is destroyed.
b. Check the sprocket nuts for tightness and make sure the lockwasher tabs are against the nuts.
c. Replace nuts that have started to round at their corners.

14. On DR250S and DR350S models, pull the front brake lever and check that the brake light comes on.
15. On DR250S and DR350S models, apply the rear brake pedal and check that the brake light comes on soon after you have begun depressing the pedal.
16. On DR250 and DR350 models, with the engine running, check to see that the headlight and taillight are on.
17A. On DR250S and DR350S models, move the dimmer switch up and down between the high and low positions, and check to see that both headlight elements are working.
17B. On DR250 and DR350 models, move the light switch up to the ON position and check to see that both the headlight and taillight are working.
18. On DR250S and DR350S models, move the turn signal switch to the left position and then to the right position and check that all 4 turn signal lights work properly.
19. On DR250S and DR350S models, push the horn button and note if the horn blows loudly.
20. If the horn or any light failed to work properly, refer to the appropriate section in Chapter Nine.

TIRES AND WHEELS

Tire Pressure

Tire pressure should be checked and adjusted to maintain good traction and handling. An accurate gauge should be carried in your tool box. The approximate tire inflation pressure specifications are listed in **Table 2**.

NOTE

*After checking and adjusting the air pressure, make sure to install the air valve cap (****Figure 2****). The cap prevents small pebbles and dirt from collecting in the valve stem; this could allow air*

leakage or result in incorrect tire pressure readings.

Tire Inspection

The tires take a lot of punishment due to the variety of terrain they are subject to. Inspect them periodically for excessive wear, cuts, abrasions, etc. Sidewall tears are the most common cause of tire failure. This type of damage is usually caused by sharp rocks or other trail conditions when riding off-road. Often times, sidewall tears cannot be seen from the outside. If necessary, remove the tire from the rim as described in Chapter Ten. Run your hand around the inside tire casing to feel for tears or sharp objects imbedded in the casing. The outside of the tire can be inspected visually.

While checking the tires, also check the position of the valve stem. If the valve stem is cocked sideways like that shown in **Figure 1**, your riding day could end because of a flat tire. Refer to *Valve Stem Alignment* in this chapter.

Wheel Spoke Tension

Tap each spoke with a wrench. The higher the pitch of sound it makes, the tighter the spoke. The lower the sound frequency, the looser the spoke. A "ping" is good, a "klunk" says the spoke is too loose.

If one or more spokes are loose, tighten them as described in Chapter Ten.

NOTE

Most spokes loosen as a group rather than individually. Extra-loose spokes should be tightened carefully. Bringing just a few spokes tight into the rim will put improper pressure across the wheel. Refer to Chapter Ten.

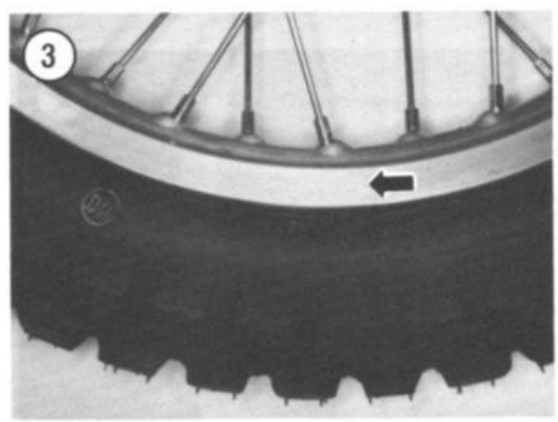
Rim Inspection

Frequently inspect the condition of the wheel rims (**Figure 3**). If a rim has been damaged it may be enough to cause excessive side-to-side play. Refer to *Wheel Spoke Service* in Chapter Ten.

Valve Stem Alignment

Before each riding day, check each tube valve stem for alignment. **Figure 1** shows a valve stem that has slipped. If the tube is not repositioned, the valve stem will eventually pull away from the tube, causing a flat. However, don't get your tire irons out yet. The tube can be aligned without removing the tire.

1. Thoroughly wash the tire (especially the sides) if it is dirty or caked with mud.
2. Remove the valve stem core and release all air pressure from the tube.
3. Loosen the rim lock nut if so equipped.
4. With an assistant steadying the bike and holding the front brake on, squeeze the tire and break the tire-to-wheel seal all the way around the perimeter of the wheel. If the tire seal is very tight, it may be necessary to lay the bike on its side and break the tire seal with your foot or a rubber mallet. Use care though; have an assistant steady the bike so that it doesn't rock and damage the handlebars or a control lever.
5. After the tire seal is broken, put the bike on a stand so that the wheel clears the ground.
6. Apply a mixture of soap and water from a spray container (like that used when changing a tire) along the tire bead on both sides of the tire.
7. Have an assistant apply the brake "hard." If necessary, tighten the front or rear brake adjuster.
8. Using both of your hands, grab hold of the tire and turn it and the tube until the valve stem is straight up at 90° to the rim.
9. When the valve stem is straight up, install the valve stem core and inflate the tire. If the soap and water solution has dried, reapply it to help the tire seat on the rim. Check the tire to make sure it seats all the way around the rim.



WARNING

Do not overinflate the tire and tube. If the tire will not seat properly remove the valve stem core and re-lubricate the tire.

10. Tighten the rim lock securely, if so equipped.

11. Adjust the tire pressure as listed in **Table 2**.

12. Install the valve stem nut but do not tighten it against the rim. If the tube and tire slip again, the valve stem will pull away from the tube and cause a flat. Instead, tighten the nut against the valve cap. This will allow the valve stem to slip without damage until you can reposition the tire and tube.

LUBRICANTS

Engine Oil

Oil is graded according to its viscosity, which is an indication of how thick it is. The Society of Automotive Engineers (SAE) system distinguishes oil viscosity by numbers, called "weights." Thick (heavy) oils have higher viscosity numbers than thin (light) oils. For example, a 5 weight (SAE 5) oil is a light oil while a 90 weight (SAE 90) oil is relatively heavy. The viscosity of the oil has nothing to do with its lubricating properties.

Grease

A good quality grease—preferably waterproof—should be used for many of the parts on your Suzuki. Water does not wash grease off parts as easily as it washes off oil. In addition, grease maintains its lubricating qualities better than oil on long and strenuous events.

In some cases in this book a special grease called molybdenum disulfide grease it specified. It is used on some parts during engine assembly and on some suspension components. Whenever this type of grease is specified it should be used as it has special lubricating qualities. Be sure to use this special type of grease, even though it may be more expensive than ordinary multipurpose grease.

BATTERY (DR250S AND DR350S)

The battery is an important component in your Suzuki's electrical system. It is also the one most frequently neglected. The battery should be cleaned and inspected at periodic intervals.

All DR250S and DR350S models are equipped with a sealed battery. There is no routine upkeep on the sealed battery other than to keep the terminals free of corrosion and keep the terminal screws securing the leads to the battery tight.

The electrolyte level cannot be corrected on a sealed battery as the battery top is not removable after it was filled with electrolyte and charged at the dealership prior to initial delivery.

NOTE

Recycle your old battery. *When you replace the old battery, be sure to turn in the old battery at that time. The lead plates and the plastic case can be recycled. Most motorcycle dealers will accept your old battery in trade when you purchase a new one, but if they will not, many automotive supply stores certainly will.* ***Never*** *place an old battery in your household trash since it is illegal, in most states, to place any acid or lead (heavy metal) contents in landfills. There is also the danger of the battery being crushed in the trash truck and spraying acid on the truck operator.*

Removal/Installation

1. Remove the seat and the left-hand side cover (**Figure 4**).

2. Remove the screw (A, **Figure 5**) securing the battery holder strap (B, **Figure 5**) and move the strap out of the way.

3. First disconnect the battery negative (–) (C, **Figure 5**) and then the positive (+) (D, **Figure 5**) leads from the battery.
4. Pull the battery (E, **Figure 5**) out of its tray.
5. Install by reversing these removal steps while noting the following:
   a. Position the battery in the case with the negative (–) terminal toward the front of the bike.
   b. Coat the battery terminals with a thin layer of dielectric grease to retard corrosion and decomposition of the terminals.
   c. Attach the positive (+) cable first then the negative (–) cable.

Inspection

For a preliminary test, connect a digital voltmeter across the battery negative and positive terminals and measure the battery voltage. A fully charged battery should read more than 12.5 volts. If the voltage is 12.5 or less the battery is under charged.

If the battery is fully charged, clean the battery terminals and surrounding case and reinstall the battery as described in this chapter. Coat the battery terminals with a thin layer of dielectric grease to retard corrosion and decomposition of the terminals.

Charging

The battery is a sealed type and if recharging is required a special type of battery charger must be used. It is recommended that the battery be recharged by a Suzuki dealer to avoid damage to a good battery that only requires recharging. The following procedure is included if you choose to recharge your battery.

CAUTION

***Never** connect a battery charger to the battery with the leads still connected. **Always** disconnect both leads from the battery. If the battery leads were left connected during the charging procedure the charger may damage the diodes within the voltage regulator/rectifier.*

NOTE

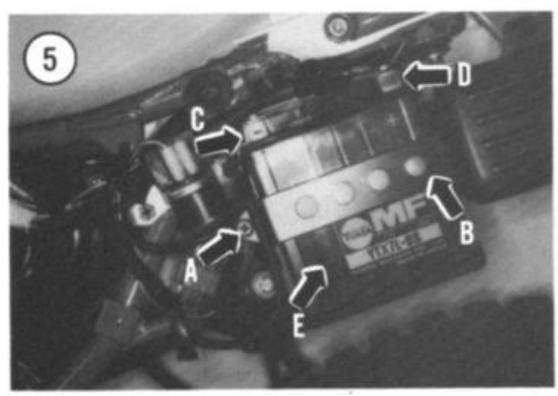
*There is a long plastic strip on top of the battery that contains sealing plugs for the 6 cells. This strip was removed when the battery was first serviced and is not to be removed thereafter. Do **not** remove this strip during the charging cycle.*

1. Remove the battery from the frame as described in this chapter.
2. Connect the positive (+) charger lead to the positive (+) battery terminal and the negative (–) charger lead to the negative (–) battery terminal.

CAUTION

Do not exceed the recommended charging amperage rate or charging time on the battery charging time label attached to the battery.

3. Set the charger to 12 volts. If the output of the charger is variable, it is best to select a low setting. Use the following suggested charging amperage and length of charge time:
   a. Standard charge: 0.7 amps at 5 hours.
   b. Quick charge: 3.0 amps at 1 hour.
4. Turn the charger ON.
5. After the battery has been charged for the specified amount of time, turn the charger off and disconnect the charger leads.
6. Allow the battery to sit for 30 minutes before checking the voltage. This will allow the battery to settle down.
7. Connect a volt meter across the battery negative and positive terminals and measure the battery voltage. A fully charged battery should read 13.0-13.2 volts. If the voltage is 12.5 or less the battery is still undercharged.
8. If the voltage is correct and if the battery remains stable for 1 hour at the specified voltage, the battery is considered charged.
9. Clean the battery terminals and surrounding case. Coat the terminals with a thin layer of dielectric



grease to retard corrosion and decomposition of the battery terminals.

10. Reinstall the battery as described in this chapter.

Battery Electrical Cable Connectors

To ensure good electrical contact between the battery and the electrical cables, the cables must be clean and free of corrosion.

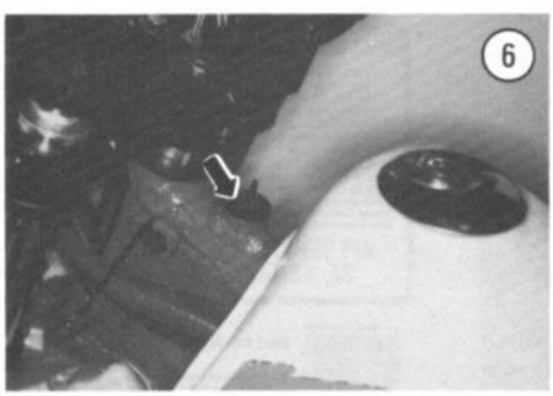
1. If the electrical cable terminals are badly corroded, disconnect them from the bike's electrical system.
2. Thoroughly clean each connector with a wire brush and then with a baking soda solution (an acid neutralizer). Wipe dry with a clean cloth.
3. After cleaning, apply a thin layer of dielectric grease to the battery terminals before reattaching the cables.
4. If disconnected, connect the electrical cables to the bike's electrical system.
5. After connecting the electrical cables, apply a light coating of dielectric grease to the electrical terminals of the battery to retard corrosion and decomposition of the terminals.

New Battery Installation

Always replace the sealed battery with another sealed-type battery. The charging system is designed to have this type of battery in the system.

When replacing the old battery with a new one, be sure to have it fully charged before installing it in the vehicle. Failure to do so will permanently damage the new battery.

Remember to recycle your old battery as previously mentioned.



PERIODIC LUBRICATION

Engine Oil Level Check

The engine on all models is a dry-sump type where the engine oil is stored in the integral oil tank in the frame rather than in the engine crankcase. If the bike has not been recently run, the oil will drain from the oil tank and settle in the crankcase. In order to get an accurate oil level reading at the filler cap/dipstick on the frame the engine must be warm, you **cannot** get an accurate reading with a cold engine.

WARNING

*Do **not** unscrew the filler cap/dipstick (**Figure 6**) after a high-speed ride. The oil tank is slightly pressurized from the heated oil and the heated oil may spurt out of the tank opening and burn your skin. Wait 2-3 minutes until the oil cools down to approximately 60° C (140° F). Protect yourself accordingly.*

1. If the engine is cold, start the engine and let it idle for three minutes.
2. Stop the engine and allow the oil to settle for 1 minute.
3. Park the bike on level ground and rest it on the sidestand.
4. Hold the bike in the upright position.
5. Unscrew the oil tank filler cap/dipstick (**Figure 6**) and wipe it clean with a lint-free cloth.
6. Reinsert it onto the threads in the hole; do *not* screw it in.
7. Remove the filler cap/dipstick and check the oil level. The bike must be on level ground and upright for a correct reading.
8. The oil level should be between the upper (MAX) and lower (MIN) lines (**Figure 7**). The oil level should never be above the upper line nor below the lower line.
9. If there is *no oil* on the filler cap/dipstick, perform the following:
   a. Insert a small funnel into the filler hole in the frame.
   b. Add the recommended weight engine oil as indicated in **Table 3** until the oil level is at the MIN line on filler cap/dipstick.
   c. Install the filler cap/dipstick and screw it on all the way.

d. Start the engine and let it idle for three minutes.
e. Shut the engine off and allow the oil to settle for 1 minute.
f. Recheck the oil level and adjust if necessary.

10. Install the filler cap/dipstick and screw it on securely.

Engine Oil and Filter Change and Oil Strainer Cleaning

The factory-recommended oil and filter change and oil strainer cleaning interval is specified in **Table 1**. This assumes that the motorcycle is operated in moderate climates. The time interval is more important than the mileage interval because combustion acids, formed by gasoline and water vapor, will contaminate the oil even if the motorcycle is not run for several months. If a motorcycle is operated under dusty conditions, the oil will get dirty more quickly and should be changed more frequently than recommended.

Use only a high-quality detergent oil with an API rating of SE or SF. The quality rating is on the bottle label (**Figure 8**). Always try to use the same brand of oil at each oil change. Use of oil additives is not recommended. Refer to **Table 3** for recommended weight of oil to use.

To change the engine oil and filter you will need the following:

a. Drain pan.
b. Small funnel.
c. 12 mm and 17 mm wrench or socket to remove drain plugs.
d. 2-3 quarts of oil. Refer to **Table 4** for specified quantities.
e. New oil filter element.

There are a number of ways to discard the used oil safely. The easiest way is to pour it from the drain pan into a gallon plastic bleach, juice or milk container for disposal.

NOTE

Never dispose of motor oil in the trash or pour it on the ground, or down a storm drain. Many service stations accept used motor oil. Many waste haulers provide curbside used motor oil collection. Do not combine other fluids with motor oil to be recycled. To find a recycling location contact the American Petroleum Institute (API) at www.recycleoil.org.

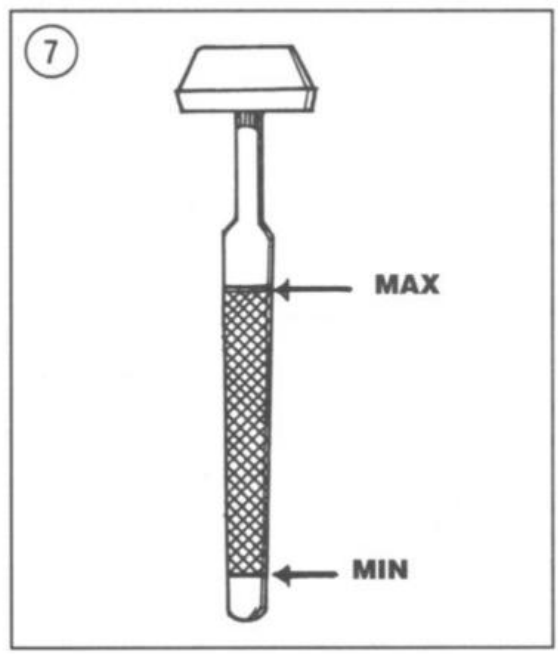
NOTE

Warming the engine allows the oil to heat up; thus it flows freely and carries contamination and any sludge buildup out with it.

1. If the engine is cold, start the engine and let it reach normal operating temperature. Usually 10-15 minutes of stop-and-go riding is sufficient. Shut the engine off and wait for about 3-5 minutes.

NOTE

Removal of the engine skid plate is optional. You can gain access to the drain bolt with the skid plate in place but some oil may drain onto the skid plate during

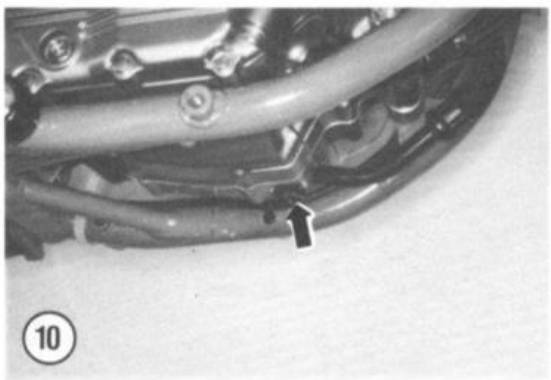


the procedure requiring a time consuming cleanup.

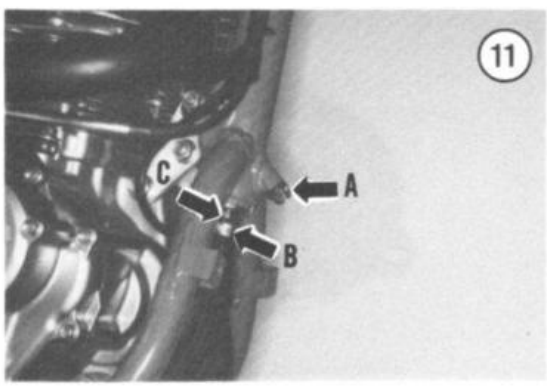
2. Remove the bolts securing the skid plate (**Figure 9**) and remove the skid plate.
3. Unscrew the oil filler cap/dipstick (**Figure 6**).

WARNING

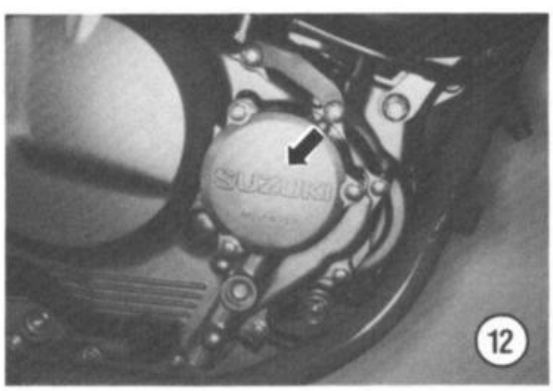
During the next step, hot oil will spurt from the drain plug hole. Be ready to move your hand away quickly once the drain plug is removed so hot oil will not run on your hand and down your arm.



4. Move the drain pan under the crankcase. Use a 17 mm wrench or socket and remove the engine drain plug and gasket (**Figure 10**).
5. Place a drain pan slightly under the frame drain plug. Use a 12 mm wrench or socket and remove the frame drain plug and gasket (A, **Figure 11**).
6. Allow the oil to drain for a minimum of 5 minutes.
7. Inspect the gasket on both the drain plugs for wear or damage, replace if necessary.
8. Reinstall both drain plugs and gasket. Tighten the plugs to the torque specification listed in **Table 5**.
9. Move the drain pan under the crankcase on the right-hand side.



10. Remove the screws securing the oil filter cover (**Figure 12**) and remove the oil filter cover and spring.
11. Withdraw the oil filter (**Figure 13**) from the receptacle in the crankcase.
12. Place the used oil filter in a heavy plastic bag to contain any residual oil. Close off the end of the bag to prevent oil from draining out.
13. Clean off the inner surface of the oil filter cover and the filter receptacle in the crankcase with a shop rag and cleaning solvent. Remove any oil sludge if necessary. Wipe it dry with a clean, lint-free cloth. Make sure the opening (A, **Figure 14**) at the base of the receptacle is open and free of sludge.



14. Remove the O-ring seal from the oil filter cover (A, **Figure 15**) and from the inner surface of the right-hand crankcase cover (B, **Figure 14**). Install *new* O-ring seals.
15. Make sure the O-ring seal (B, **Figure 14**) is in place in the crankcase cover.
16. Position the new oil filter element with the open end (**Figure 16**) going in first and install the new oil filter element (**Figure 13**).

17. Install the spring (B, **Figure 15**) into the cover and install the cover (**Figure 12**) and screws. Tighten the screws securely.
18. To remove and clean the oil strainer in the oil hose, perform the following:
    a. Loosen the hose clamp (B, **Figure 11**) securing the oil line fitting to the frame.
    b. Carefully lower the oil line down and away from the frame fitting.
    c. Unscrew the oil strainer assembly (C, **Figure 11**) from the receptacle in the frame.
    d. Inspect the O-ring seal on the oil strainer for hardness or deterioration, replace if necessary.
    e. Thoroughly clean the oil strainer with solvent and a soft tooth brush and thoroughly dry with compressed air. Inspect the filter screen for holes or defects. If the oil strainer is damaged in any way, replace it.
    f. Install the oil strainer and tighten to the torque specification listed in **Table 5**.
    g. Move the lower oil line into position onto the fitting on the frame.
    h. Install the hose and tighten the clamp screw securely.
19. Insert a funnel into the oil fill hole in the frame and fill the engine with the correct type (**Table 3**) and quantity (**Table 4**) of oil.
20 Screw in the oil filler cap/dipstick (**Figure 6**) into the fitting on the frame and tighten securely.
21. Start the engine and check for oil leaks. If necessary, tighten any drain bolts or screws.
22. Turn the engine off and check the oil level, correct if necessary.
23. Install the skid plate underneath the engine and install the bolts. Tighten the bolts securely.

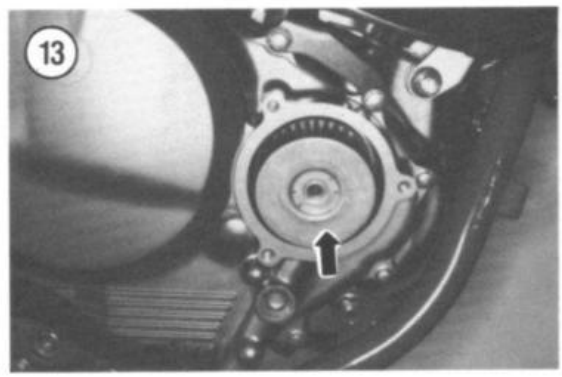
Front Fork Oil Change

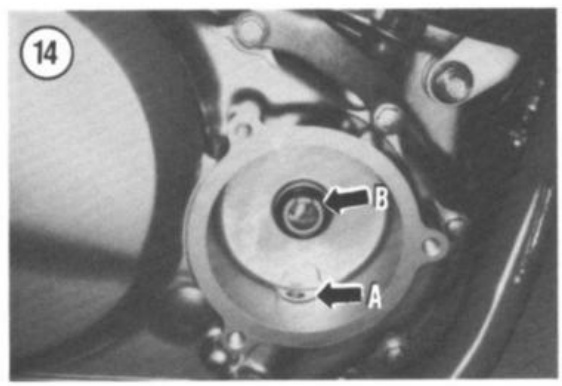
The fork oil should be changed at the interval listed in **Table 1** or once a year. If it becomes contaminated with dirt or water, change it immediately.

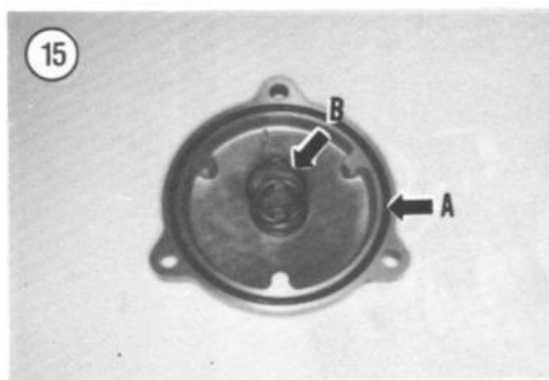
The front fork is not equipped with a drain plug. Therefore the fork assembly must be removed from the frame and partially disassembled to drain the fork oil.

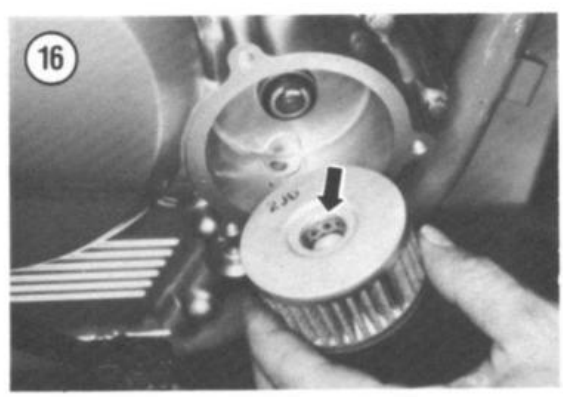
NOTE

*If you recycle your old engine oil **never** add used fork oil to the old engine oil. Most oil retailers that accept old oil for*



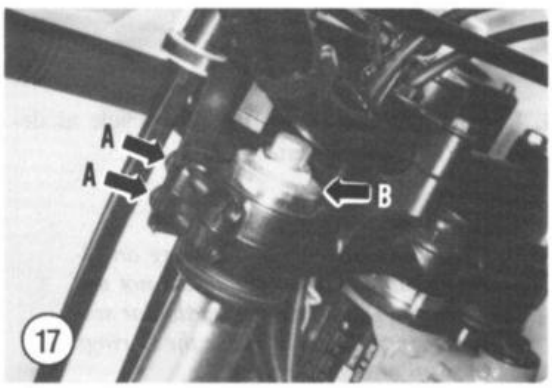


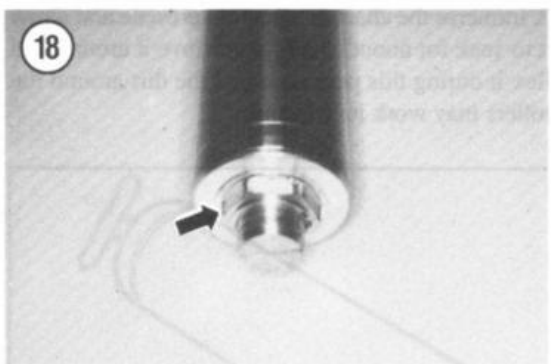


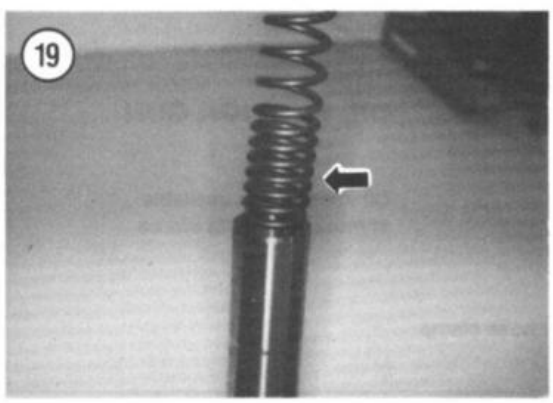


recycling may not accept the oil if other fluids (fork oil, brake fluid or any other type of petroleum based fluids) have been combined with it.

1. Loosen the upper fork bridge bolts (A, **Figure 17**).
2. Loosen the fork cap (B, **Figure 17**).
3. Remove the fork from the frame as described in Chapter Ten.
4. Remove the fork cap (**Figure 18**) and withdraw the fork spring (**Figure 19**).







5. Turn the fork assembly upside down and drain the fork oil in to a drain pan. Discard the fork oil—never reuse fork oil.
6. Pump the fork several times to expel as much fork oil as possible. Allow the fork assembly to sit upside down for 10-20 minutes to drain thoroughly.

NOTE

To measure the correct amount of fluid, use a plastic baby bottle. These bottles have measurements in fluid ounces (oz.) and cubic centimeters (cc) on the side.

7. Fill the fork with the specified weight (see **Table 3**) and approximate quantity (see **Table 4**) fork oil.

NOTE

Suzuki recommends that the fork oil level be measured, if possible, to ensure a more accurate filling.

8. Hold the fork assembly vertical. Use an accurate ruler or the Suzuki oil level gauge (part No. 09943-74111) to achieve the oil level as specified in **Table 4**.

NOTE

*An oil level measuring devise can be made as shown in **Figure 20**. Position the lower edge of the hose clamp the specified oil level distance up from the small diameter hole. Fill the fork with a few cc's more than the required amount of oil. Position the hose clamp on the top edge of the fork tube and draw out the excess oil. Oil is sucked out until the level reaches the small diameter hole. A precise oil level can be achieved with this simple device.*

9. Allow the oil to settle completely and recheck the oil level measurement. Adjust the oil level if necessary.
10. Install the fork spring with the closer wound coils (**Figure 19**) going in first.
11. Inspect the O-ring seal (**Figure 21**) on the fork cap bolt; replace if necessary.
12. Install the fork cap bolt (**Figure 18**) while pushing down on the spring. Start the bolt slowly, don't cross-thread it. Tighten to the torque specification listed in **Table 5**.
13. Repeat Step 1 through Step 12 for the opposite fork.

14. Install both fork assemblies as described in Chapter Ten.
15. Road test the bike and check for oil leaks.

Drive Chain

The factory installed drive chain on all models is an O-ring type that has O-rings installed between the chain plates. Lubrication for the chain pins is permanently sealed by the O-rings (**Figure 22**). However, the chain rollers require external oiling. For the O-ring chain to work properly, it requires proper cleaning and lubrication practices. Do not clean the O-ring drive chain with a high-pressure water hose, such as those found in coin-operated car washes. The high pressure can damage the chains O-rings, resulting in the loss of the internal lubrication which will lead to pre-mature chain failure.

A properly maintained drive chain will provide maximum service life and reliability. The drive chain should be lubricated before each ride and during the day as required. Models that are ridden off-road will require more frequent drive chain lubrication and cleaning because they are subjected to dirt, water and mud not normally encountered in street riding.

Periodic lubrication

1. Shift the transmission to NEUTRAL.
2. Place wood block(s) under the engine to support the bike securely with the rear wheel off the ground.
3. Oil the bottom run (**Figure 23**) of the drive chain with a commercial chain lubricant formulated for use on O-ring drive chains. If this is not available, SAE 30W/50 engine oil can be used.
4. Rotate the rear wheel until the entire drive chain run is lubricated.
5. Moisten a shop cloth in solvent or with soap and water and wipe off any chain lubrication residue from the rear tire and rim.

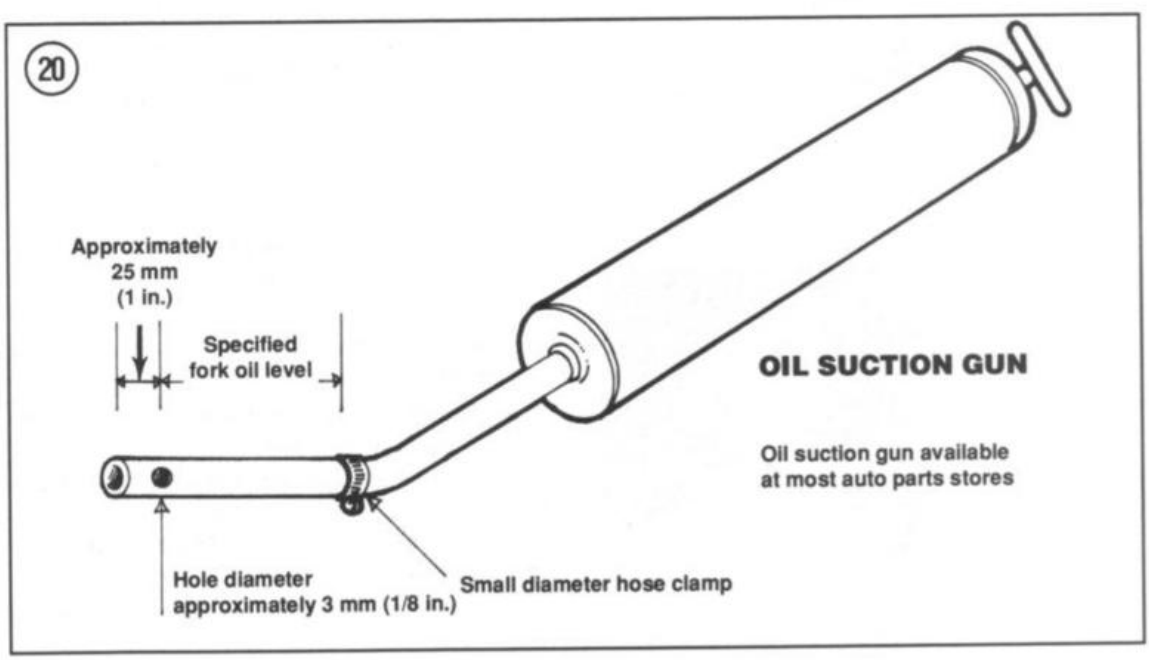
Chain cleaning

1. Remove the chain from the motorcycle as described in Chapter Eleven.

CAUTION

Use only kerosene for cleaning an O-ring equipped drive chain. Do not use trichlene, gasoline or other similar solvents since they will cause the O-rings to swell or deteriorate.

2. Immerse the chain in a pan of kerosene and allow it to soak for about a half hour. Move it around and flex it during this period so that the dirt around the rollers may work its way out.



3. Hang up the drive chain and allow it to thoroughly dry. Place an empty container underneath the chain to catch all kerosene runoff.

4. While the drive chain is still hanging up, lubricate it with a good grade of chain lubricant formulated for use on O-ring drive chains. Carefully following the manufacturer's instructions. If this is not available, SAE 30W/50 engine oil can be used.

5. Reinstall the chain on the motorcycle as described in Chapter Eleven.

Control Cables

The control cables should be lubricated at intervals as described in **Table 1**. Also they should be inspected at this time for fraying and the cable sheath should be checked for chafing. The cables are relatively inexpensive and should be replaced when found to be faulty.

A can of cable lube and a cable lubricator will be required for this procedure.

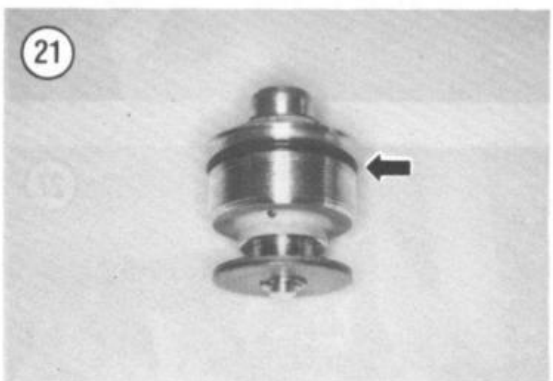
NOTE

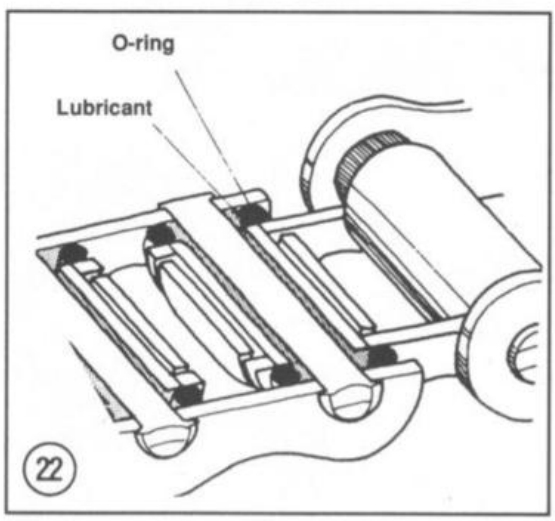
If you are having trouble with the stock cables you may want to install Teflon-lined cables. These cables are smoother than the stock cables and can be washed in warm soapy water. They don't require any oiling and will last longer than steel lined cables.

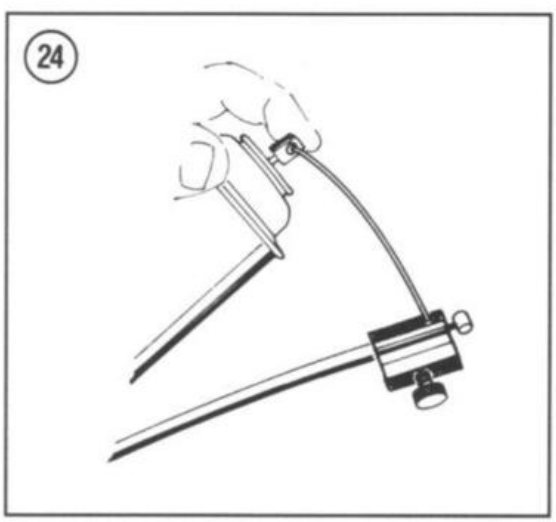
This procedure should be performed on steel lined cables only. *Do not* oil Teflon-lined cables.

1. Disconnect the cables from the clutch lever, decompression lever (models so equipped) and the throttle grip assembly and from where they attach to the clutch mechanism, decompression lever or to the carburetor.

2. Attach a cable lubricator following the manufacturer's instructions (**Figure 24**).







3. Insert the nozzle of the lubricant can in the lubricator, press the button on the can and hold down until the lubricant begins to flow out of the other end of the cable.

NOTE

Place a shop cloth at the end of the cable to catch the oil as it runs out the end or place the end in an empty container. Discard this oil as it is dirty.

4. Remove the lubricator, reconnect the cable(s) and adjust the cable(s) as described in this chapter.

Swing Arm and Relay Arm Lubrication

Grease nipples are fitted to the swing arm (**Figure 25**) and (**Figure 26**) relay arm pivot shafts (**Figure 27**) and (**Figure 28**) for periodic lubrication. At the intervals specified in **Table 1**, use a grease gun filled with a lithium soap base grease and lubricate each of the pivot shafts.

CAUTION

*Make sure to wipe off the grease nipple with a shop cloth **before** using the grease gun. This prevents dirt from being mixed with the grease, entering the area and contaminating the pivot shaft and bearing area.*

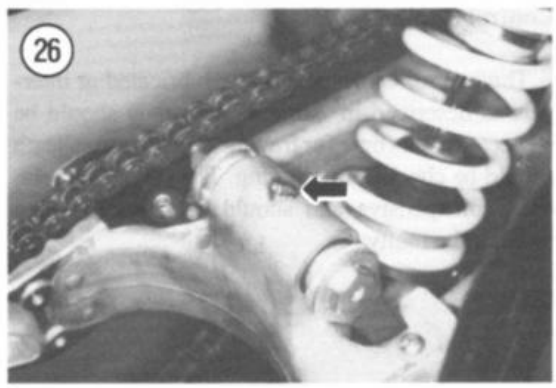
Wipe off the grease nipples after applying the grease. This will lessen the amount of dirt that will collect at these points.

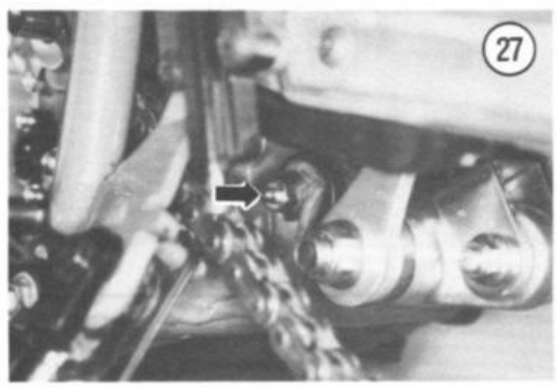
Speedometer or Tripmeter Cable Lubrication

Lubricate the speedometer or tripmeter cable every year or whenever needle operation becomes erratic.

1A. On DR250 and DR350 models, perform the following:

a. Remove the lower screw and washer securing the lower portion of the headlight fairing
b. Carefully pull up on the fairing and unhook the single rubber strap securing the fairing at the top and remove the faring.
c. Unscrew the retaining collar and remove the cable from the tripmeter instrument or from the front wheel.

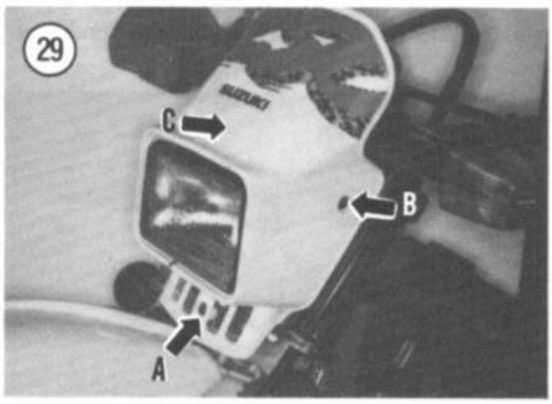


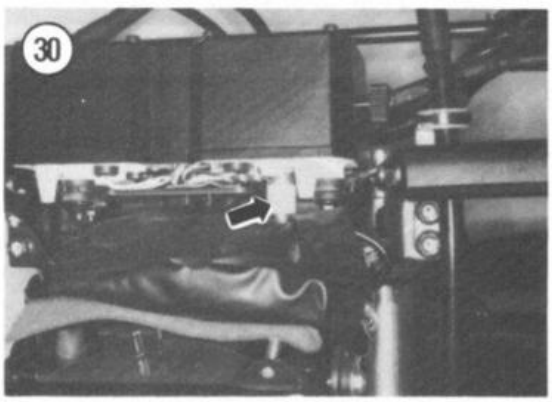


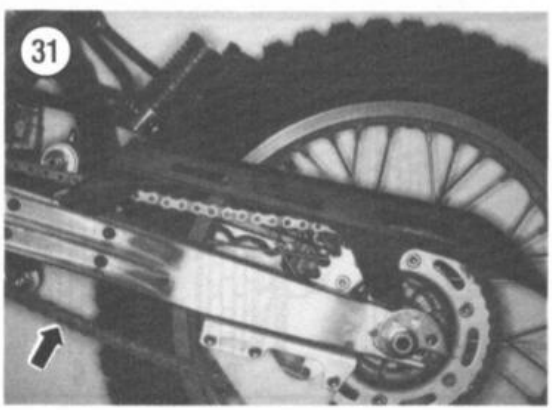
1B. On DR250S and DR350S models, perform the following:

a. Remove the lower screw and collar (A, **Figure 29**) securing the lower portion of the headlight fairing.

b. Remove the side screw and collar (B, **Figure 29**) on each side securing the headlight fairing on each side and remove the headlight fairing (C, **Figure 29**).







c. Unscrew the retaining collar and remove the cable from the speedometer instrument (**Figure 30**) or from the front wheel.
2. Pull the cable from the cable sheath.
3. If the grease on the cable is contaminated, thoroughly clean off all old grease.
4. Thoroughly coat the cable with a good grade of multipurpose grease and reinstall into the sheath.
5. Make sure the cable is correctly seated into the drive unit.
6. Install the headlight faring.

Miscellaneous Lubrication Points

Use SAE 10W/30 motor oil and lubricate the clutch lever, decompression lever (models so equipped), front brake lever, rear brake pedal pivot point and the sidestand pivot point.

PERIODIC MAINTENANCE

Drive Chain Free Play Inspection

The drive chain must have adequate free play so that the chain is not strung tight when the swing arm is horizontal. On the other hand, too much play may cause the chain to jump off the sprockets with potentially disastrous results. When riding in mud and sand, dirt buildup will make the chain tighter. Recheck chain play and readjust as required. Set free play within the specifications listed in **Table 6**.
1. Shift the transmission to NEUTRAL.
2. Place the bike on a stand so that the rear wheel clears the ground. Spin the rear wheel and check the chain for tightness at several spots. Check and adjust the chain at its tightest point.
3. Lower the bike so that both wheels are on the ground and the bike is in a vertical position. Have an assistant sit on the seat when performing the following step.
4. Push the middle of the lower chain run up and down (**Figure 31**). The play should be within the specifications in **Table 6**.

Drive Chain Adjustment

When adjusting the drive chain, you must also maintain rear wheel alignment. A misaligned rear wheel can cause poor handling and pulling to one side, as well as increased sprocket and chain wear.

Cam type chain adjusters are used on all models. Notches (A, **Figure 32**) are cut into the outside of the adjuster that align with a series of numbers and index marks. The slots engage a hardened pin (B, **Figure 32**) installed in each side of the swing arm. When both adjusters are set at the same mark the rear wheel should be aligned correctly.

1. Remove the cotter pin (A, **Figure 33**) and loosen the rear axle nut (B, **Figure 33**). Discard the cotter pin.

2. Turn each chain adjuster (C, **Figure 33**) in either direction in equal amounts until the chain play is within specification. The left- and right-hand adjusters should be set to the same alignment mark. Do not overtighten the drive chain as it will result in premature drive chain, drive sprocket and driven sprocket wear.

3. When the chain play is correct, check wheel alignment. Sight along the top of the drive chain from the rear sprocket to see that it is correctly aligned. It should leave the top of the rear sprocket in a straight line (A, **Figure 34**). If it is cocked to one side or the other (B and C, **Figure 34**) the wheel is incorrectly aligned and must be corrected.

4. Tighten the axle nut (B, **Figure 33**) to the torque specification in **Table 5**.

NOTE

When tightening the axle nut, check the position of the chain adjusters. Typically, one adjuster will slip or rotate out of its adjustment slot (usually the one on the opposite side of the axle nut) as the axle nut is tightened. If an adjuster moves, check the hardened pins and the adjuster(s) for damage. Because the adjuster engagement area is small, any damage to the adjuster or pin will allow the adjuster to slip when the axle nut is tightened. When tightening the axle nut, make sure the adjuster slots engage the hardened pin completely. If an adjuster does not register with the hardened pin correctly, it will become damaged. This is something you will have to check whenever the rear axle nut is tightened.

5. Recheck chain play and alignment.

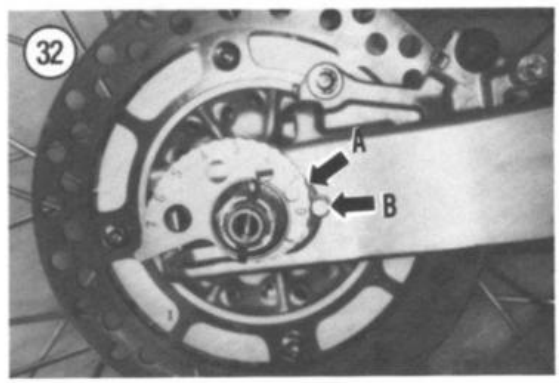
6. Install a new cotter pin (A, **Figure 33**) through the end of the axle. Bend the pin over to lock the nut.

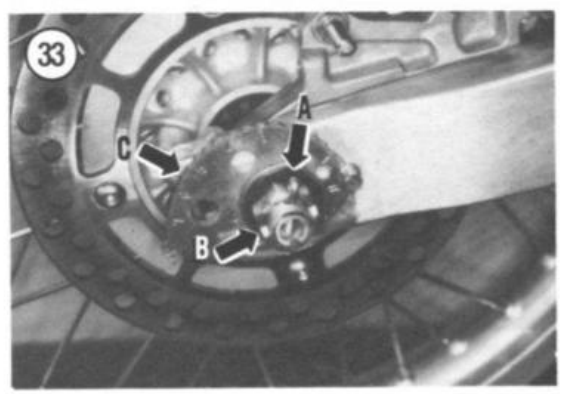
Drive Chain Inspection

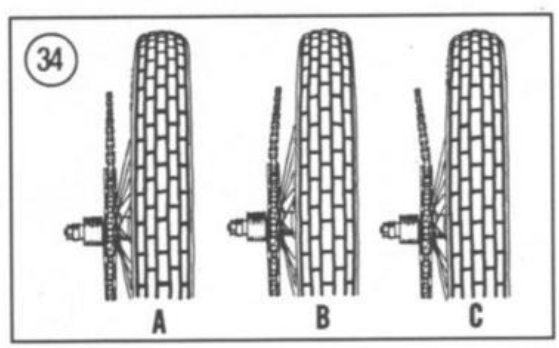
Even with proper lubrication, cleaning and periodic adjustment, the drive chain and both sprockets will wear out. Wear to the pins and bushings results in chain stretch or lengthening of the chain.

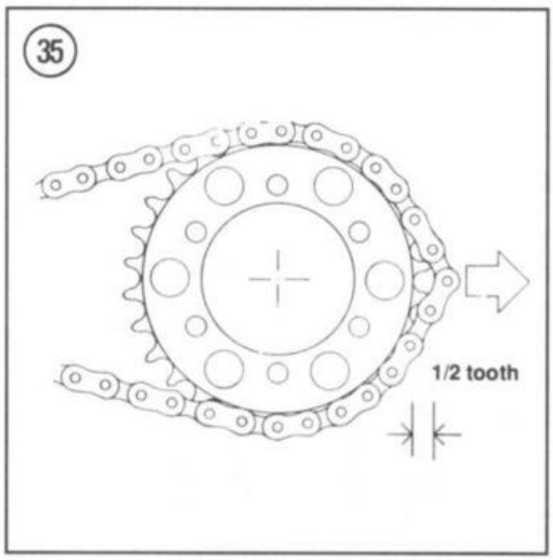
To get an indication of chain stretch, pull one of the links away from the rear driven sprocket (**Figure 35**). If the link pulls away more than 1/2 the height of a sprocket tooth, the chain should be replaced.

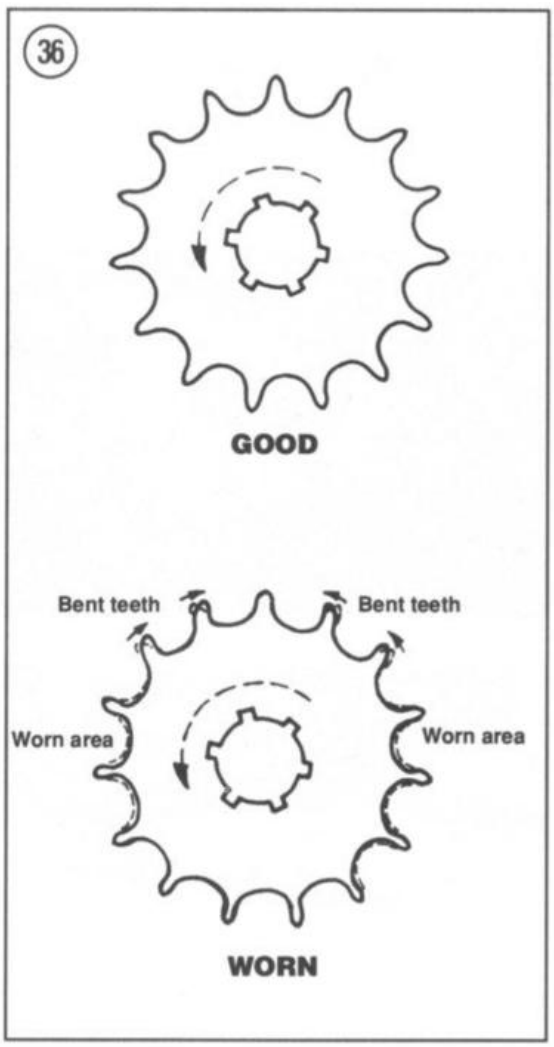
If the drive chain is worn, inspect the rear driven sprocket and the engine drive sprocket for undercut-











ting or sharp teeth (**Figure 36**). If wear is evident, replace the sprockets too, or you'll soon wear out a new drive chain.

NOTE

*Check the inner faces of the inner plates (**Figure 37**). They should be lightly polished on both sides. If they show considerable wear on both sides, the sprockets are not aligned. Adjust alignment as described under **Drive Chain Adjustment** in this chapter.*

Drive Chain Rollers, Guide and Slider Inspection and Replacement

The drive chain guide (**Figure 38**), the buffer (A, **Figure 39**), upper roller (**Figure 40**) and the lower roller (B, **Figure 39**) should be inspected and replaced as necessary. A worn or damaged chain guard, guide or slider will allow the drive chain to damage the swing arm.

1. To replace a drive chain buffer, perform the following:
   a. Remove the swing arm as described in Chapter Eleven.
   b. Remove the bolts and washers securing the buffer (**Figure 41**) to the swing arm pivot area and remove it. Install a new guard and tighten the bolts securely.
   c. Install the swing arm.
2. To replace a swing arm chain guide, perform the following:
   a. Remove the drive chain as described in Chapter Eleven.
   b. Remove the bolts and nuts securing the guide to the swing arm and remove the slider.
   c. Install a new guide and bolts. Tighten the bolts securely.
3. To replace either roller, perform the following:
   a. Remove the bolt, nut (C, **Figure 39**) and washers securing the roller to the frame and remove the roller.
   b. Apply multipurpose grease to the bolt.
   c. Install a new roller, with a washer on each side and the bolt. Tighten the bolt securely.

Front Disc Brake Lever Adjustment

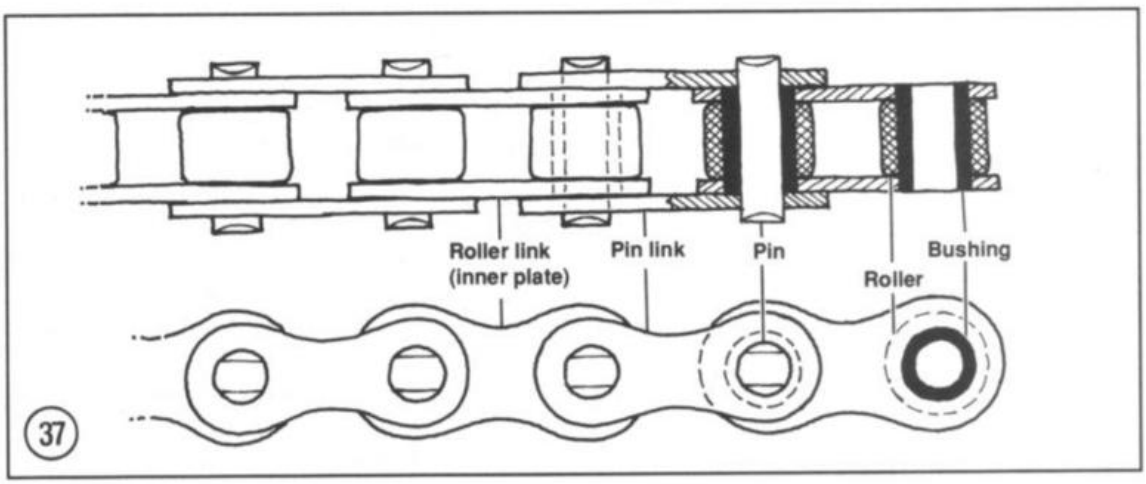
Brake pad wear in the caliper is automatically adjusted as the piston moves forward in the caliper.

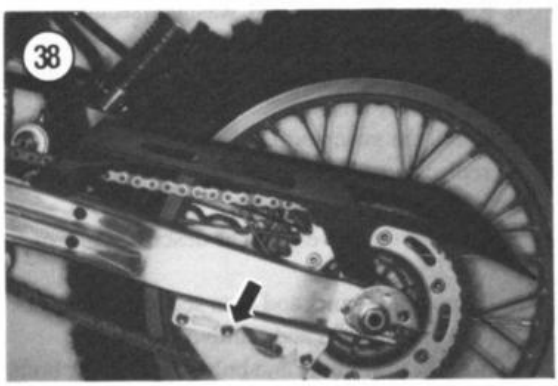
However, the front brake lever free play must be maintained to prevent excessive brake drag. This would cause premature brake pad wear. Adjust the brake lever so there is approximately 0-0.3 mm (0-0.01 in.) free play.

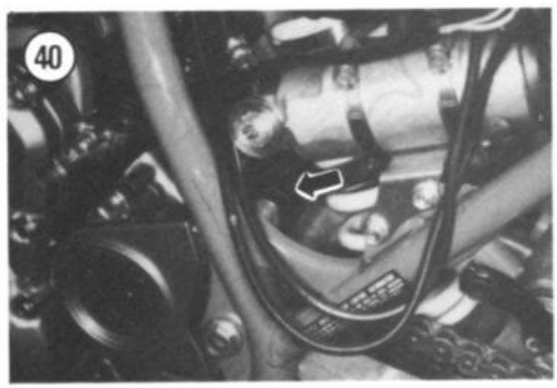
1. Loosen the adjust screw locknut (A, **Figure 42**) and turn the adjust screw (B, **Figure 42**) in or out to obtain the correct amount of brake lever free play.
2. Tighten the locknut and recheck the free play.
3. Operate the brake lever and make sure it moves freely.

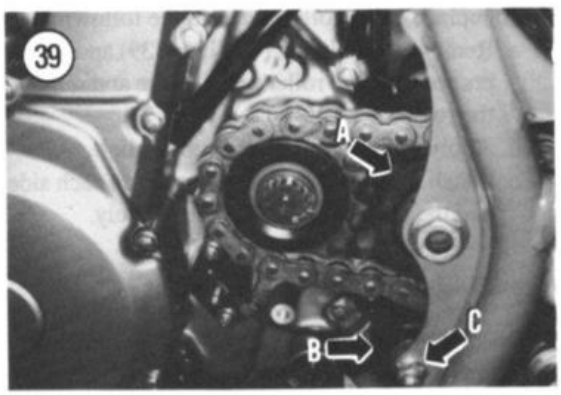
Rear Brake Pedal Height Adjustment

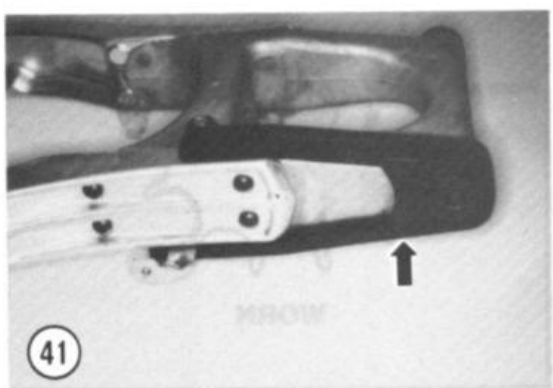
1. Measure the height position from the top of the right-hand footpeg to the top of the rear brake pedal.

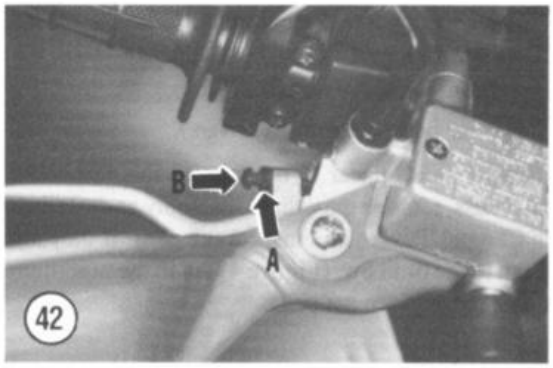


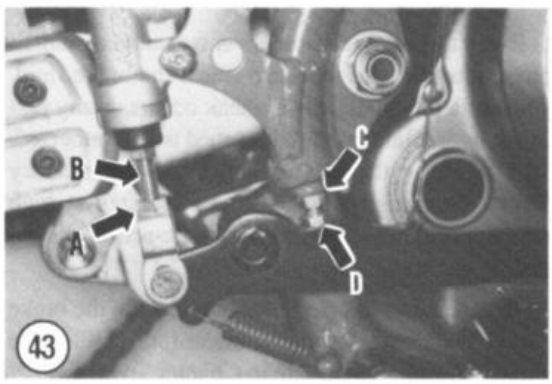


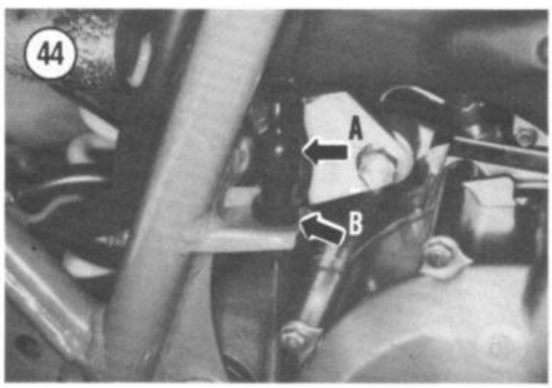


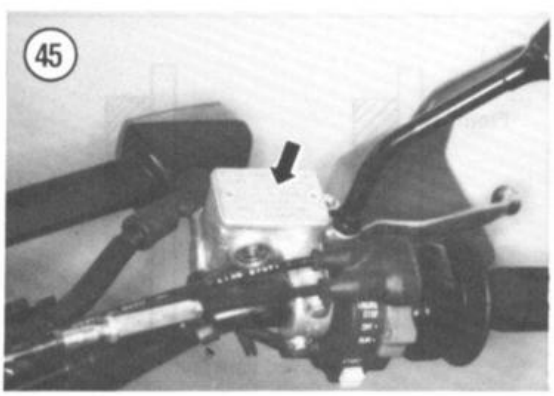












The specified distance is 5 mm (0.2 in.) *below* the top of the footpeg.

2. To adjust the pedal height, loosen the master cylinder pushrod locknut (A, **Figure 43**) and rotate the pushrod (B, **Figure 43**) until the correct height is obtained.
3. Tighten the locknut (A, **Figure 43**) securely and recheck the pedal height position.
4. Loosen the stopper bolt locknut (C, **Figure 43**) and rotate the stopper bolt (D, **Figure 43**) until there is zero clearance (but not applying any pressure) between the bolt head and the top of the brake pedal.
5. Tighten the locknut (C, **Figure 43**) securely and recheck the clearance—it must be zero.

Rear Brake Light Switch Adjustment (DR250S and DR350S)

1. Turn the ignition switch to ON.
2. Depress the brake pedal. The light should come on just as the rear brake begins to work.
3. To make the light come on earlier, hold the switch body (A, **Figure 44**) and turn the adjusting nut (B, **Figure 44**) as required.

Brake Fluid Level Check

The brake fluid in each master cylinder reservoir should always be kept above the lower level line marked on the front master cylinder window or side of rear reservoir with DOT 4 brake fluid.

NOTE

If the brake fluid level lowers rapidly, check the disc brake line, all line fittings and the caliper piston for leakage.

1. Position the handlebars so the front master cylinder reservoir is level.
2. Clean any dirt from the area around the top covers prior to removing the covers.
3. Remove the screws securing the front top cover (**Figure 45**) or remove the bolt (A, **Figure 46**) and bracket and unscrew the rear cap (B, **Figure 46**). Remove the top cover and the diaphragm.

WARNING

Use brake fluid from a sealed container and clearly marked DOT 4 only (specified for disc brakes). Others may vaporize and cause brake failure. Do not intermix different brands or types of

brake fluid as they may not be compatible. Do not intermix a silicone based (DOT 5) brake fluid as it can cause brake component damage leading to brake system failure.

CAUTION

Be careful when handling brake fluid. Do not spill it on painted or plated surfaces or plastic parts as it will destroy the surface. Wash the area immediately with soapy water and thoroughly rinse it off.

4. Add DOT 4 brake fluid until the level is to the upper level line within the master cylinder reservoir. Refer to **Figure 45** for the front master cylinder or C, **Figure 46** for the rear master cylinder. Use fresh brake fluid from a sealed brake fluid container.
5. Reinstall the diaphragm and the top cover. Tighten the screws securely on the front master cylinder. On rear disc brake, tighten the cap securely, install the bracket and bolt. Tighten the bolt securely.

Disc Brake Hoses and Seals

Disc brake hoses should be replaced every 4 years; the brake piston seals should be replaced every 2 years.

Check brake hoses between each master cylinder and each brake caliper. If there is any leakage, tighten the connections and bleed the brakes as described in Chapter Twelve. If this does not stop the leak or if a line is obviously damaged, cracked, or chafed, replace the hose and seals and bleed the brake.

Disc Brake Pad Wear

A preliminary inspection of the brake pads can be performed without disassembling the caliper assembly or removing the brake pads. If the pads appear to be worn down to the recommended replacement thickness, it is suggested that the brake caliper be removed from the disc for a thorough inspection.

From the front of the bike, look up into the lower portion of the caliper assembly. Inspect the lower edge of the brake pads.

From the rear of the bike, look into the rear of the caliper assembly. Inspect the rear edge of the brake pads.

The recommended minimum thickness of the brake pads are as follows:

a. Front pads: 3.0 mm (0.118 in.).

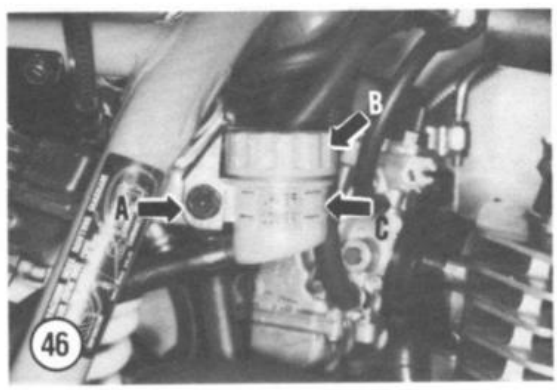
b. Rear pads: 3.5 mm (0.138 in.).

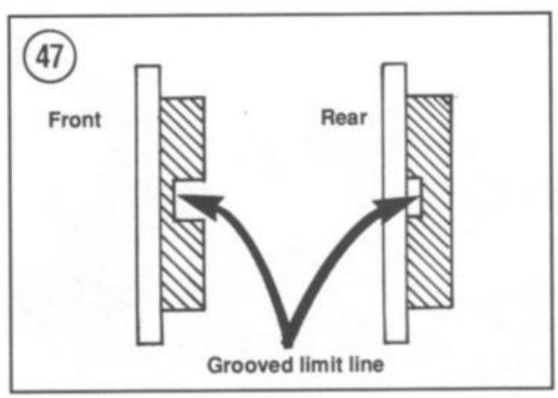
If the pads appear to be worn to this minimum thickness, remove the caliper assembly as described in Chapter Twelve and inspect the pads. If they are worn to the limit line (**Figure 47**) or to the minimum thickness, replace the pads.

Disc Brake Fluid Change

Every time the reservoir cover is removed, a small amount of dirt and moisture enters the brake fluid. The same thing happens if a leak occurs or any part of the hydraulic system is loosened or disconnected. Dirt can clog the system and cause unnecessary wear. Water in the brake fluid vaporizes at high temperature, impairing the hydraulic action and reducing the brake's stopping ability.

To maintain peak performance, change the brake fluid once a year. To change brake fluid, follow the *Brake Bleeding* procedure in Chapter Twelve.





WARNING

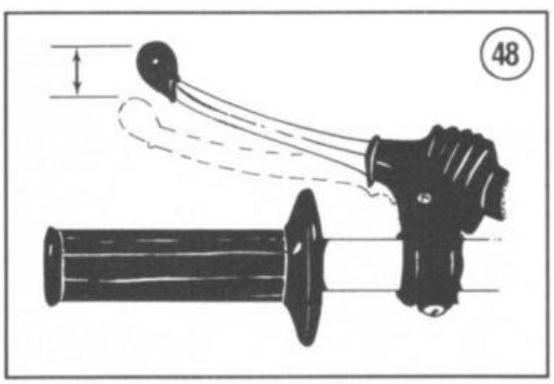
Use brake fluid clearly marked DOT 4 and specified for disc brakes. Others may vaporize and cause brake failure. Do not intermix different brands or types of brake fluid as they may not be compatible. Do not intermix a silicone based (DOT 5) brake fluid as it can cause brake component damage leading to brake system failure.

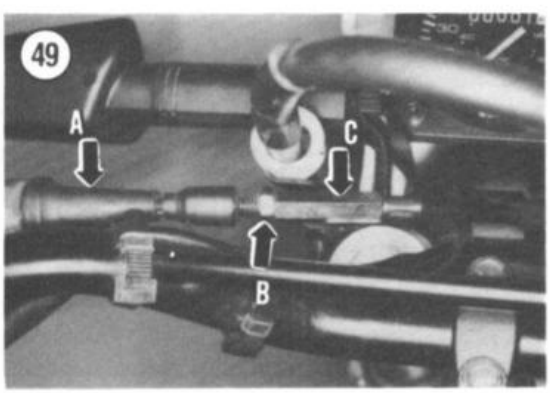
Clutch Adjustment

Continuous use of the clutch lever causes the clutch cable to stretch. For the clutch to operate correctly, the clutch cable free play must be maintained at 10-15 mm (0.4-0.6 in.). If there is no clutch cable free play, the clutch cannot disengage completely. This would cause clutch slippage and rapid clutch plate wear.

The clutch cable has two adjustment points that are adjacent to the clutch hand lever.

1. Pull the clutch lever toward the handlebar. When cable resistance is felt, hold the lever and measure the distance the tip of the lever has moved as shown in **Figure 48**. This is clutch cable free play. If resistance was felt as soon as you pulled the clutch lever, there is no cable free play. If adjustment is necessary, proceed to Step 2.





2. Slide back the rubber boot (A, **Figure 49**) from the clutch lever.
3. At the clutch hand lever loosen the inner locknut and turn the inner adjusting barrel in all the way toward the hand lever.
4. Loosen the outer locknut (B, **Figure 49**) and turn the outer adjusting barrel (C, **Figure 49**) in or out to obtain the correct amount of free play.
5. Tighten both the inner and outer locknuts securely.
6. Slide back the rubber boot back into place over the inner adjusters.
7. If the clutch cable free play cannot be achieved using these adjustment points, the clutch cable has stretched excessively and must be replaced as described in Chapter Six.

Single Throttle Cable Adjustment and Operation (1990-1991 DR250S and 1990-1991 DR350S)

These models use a single throttle cable setup that performs both the "pull" and "push" action on the cable.

For correct operation, the throttle cable must have free play. In time, the throttle cable free play will become excessive from cable stretch. This will delay throttle response and affect low speed operation. On the other hand, if there is no throttle cable free play, an excessively high idle can result.

The throttle cable should have 0.5-1.0 mm (0.02-0.04 in.) of clearance at the throttle grip end of the cable.

1. Remove the seat.
2. Remove the fuel tank as described in Chapter Eight.
3. At the throttle grip, slide back the rubber boot on the upper adjuster.
4. At the throttle grip, loosen the locknut and turn the adjuster barrel in all the way toward the throttle lever.
5. At the carburetor, loosen the locknut and turn the adjuster until the free play is correct. Tighten the locknut securely.
6. Tighten the locknut at the throttle lever.

Dual Throttle Cable Adjustment and Operation (All Models other than 1990-1991 DR250S and 1990-1991 DR350S)

These use a dual throttle cable setup. One cable is a "pull" cable and the other is a "push" cable.

For correct operation, both throttle cables must have free play. In time, the throttle cable free play will become excessive from cable stretch. This will delay throttle response and affect low speed operation. On the other hand, if there is no throttle cable free play, an excessively high idle can result.

Adjust the "push" cable first, then the "pull" cable. At the throttle grip, the front "push" cable is located next to the master cylinder body and the rear "pull" cable is closer to the rider. At the carburetor throttle wheel, the "push" cable is located in the front slot in the throttle wheel and the "pull" cable is located in the rear slot in the throttle wheel.

Pull cable

The "pull" cable adjuster should have 2-3 mm (0.08-0.12 in.) of clearance at the carburetor throttle cable bracket as shown in **Figure 50**.

1. At the carburetor throttle cable bracket, loosen the locknut (A, **Figure 51**).
2. Turn the adjuster (B, **Figure 51**) until the free play is correct. Tighten the locknut.

Push cable

The "push" cable adjuster should have 0.5-1.0 mm (0.02-0.04 in.) of clearance at the throttle cable adjuster.

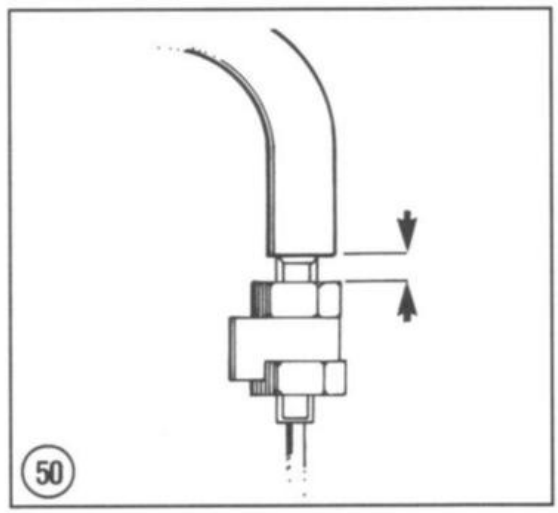
1. Turn the handlebar all the way to the left.
2. At the throttle grip end of the cable, loosen the locknut (A, **Figure 52**).
3. Turn the adjuster (B, **Figure 52**) until the free play (C, **Figure 52**) is correct. Tighten the locknut (A, **Figure 52**).
4. Open the throttle completely. There must be 1.0 mm (0.04 in.) clearance between the throttle wheel and the stop on the carburetor boss.

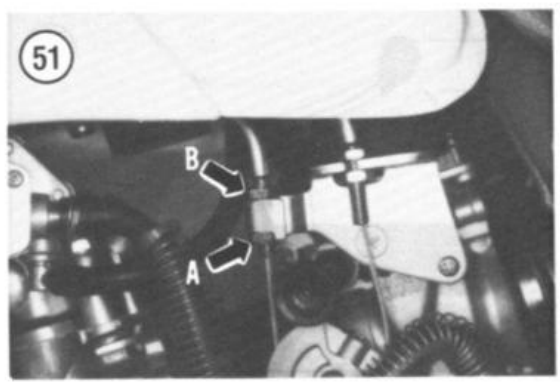
NOTE

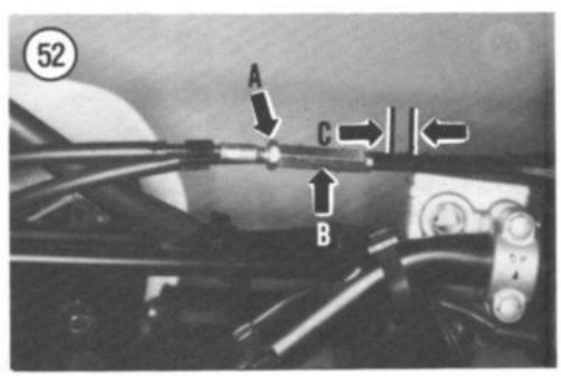
If the throttle cable free play cannot be adjusted correctly, the throttle cables have stretched excessively and must be replaced as a set as described in Chapter Eight.

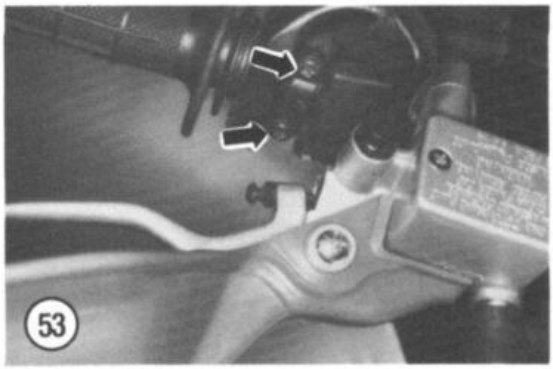
5. Make sure the throttle grip rotates freely from a fully closed to fully open position.

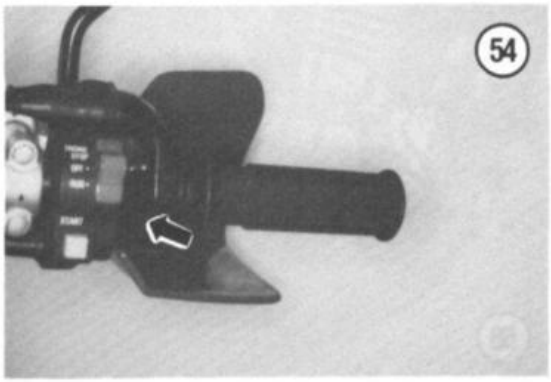
6. Start the engine and allow it to idle. Turn the handlebar from side-to-side. If the idle increases, the throttle cables are routed incorrectly or there is not enough cable free play. Reroute or readjust the cables.

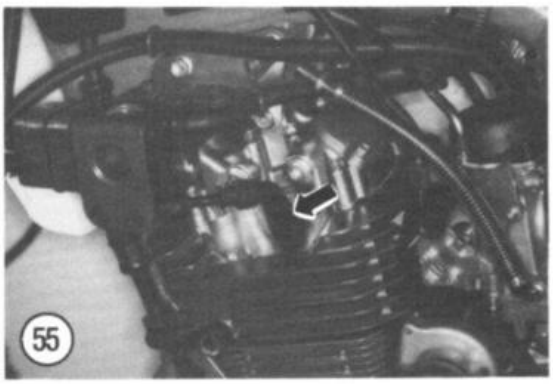


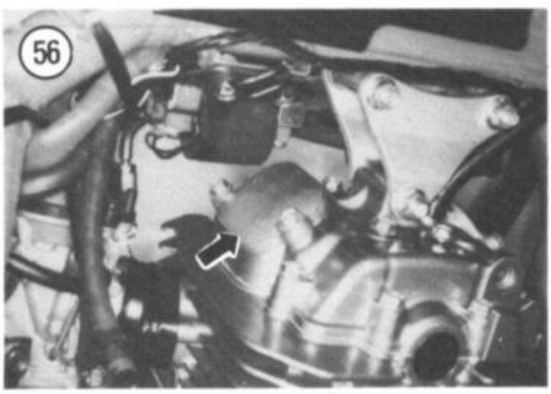












Throttle Grip

Periodically, the throttle grip and throttle housing should be cleaned and serviced.

1. Remove the Phillips screws (**Figure 53**) securing the throttle housing.
2. Separate the throttle housing (**Figure 54**).
3. Disconnect the throttle cable(s) at the twist grip.
4. Clean the inner twist grip bore with electrical contact cleaner.
5. Clean the throttle housings thoroughly.
6. Check the end of the handlebar for burrs or other damage that would cause the twist grip to stick or operate sluggishly. If necessary, smooth the end of the handlebar with a fine-cut file.
7. Lubricate the handlebar portion where the throttle grip rides and the metal surface of the throttle assembly with a good quality multipurpose grease.
8. Install by reversing these steps. Make sure the throttle grip rotates freely from a fully closed to fully open position.

Decompression Lever Adjustment (DR250 and DR350)

NOTE

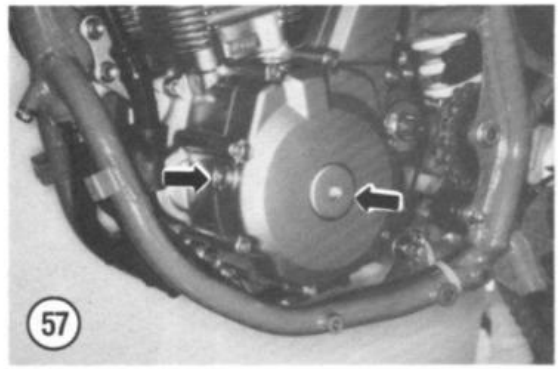
Valve clearance must be correctly adjusted prior to adjusting the decompression lever. Refer to ***Valve Clearance Adjustment*** *in this chapter.*

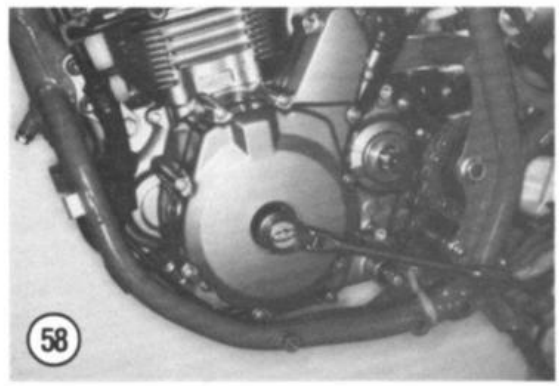
1. Place the bike on its sidestand.
2. Remove the seat and both frame side covers.
3. Remove the fuel tank as described in Chapter Eight.
4. Remove the spark plug (**Figure 55**) as described in this chapter. This will make it easier to rotate the engine by hand.
5. Remove both valve adjuster covers (**Figure 56**) from the cylinder head cover.
6. Place a drip pan under the left-hand crankcase cover as some oil may drain out when the timing hole covers are removed in the next step.
7. Remove the 2 covers (**Figure 57**) from the timing holes on the left-hand crankcase cover.

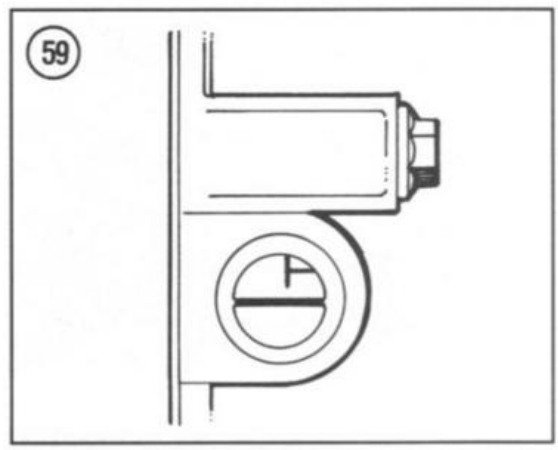
NOTE

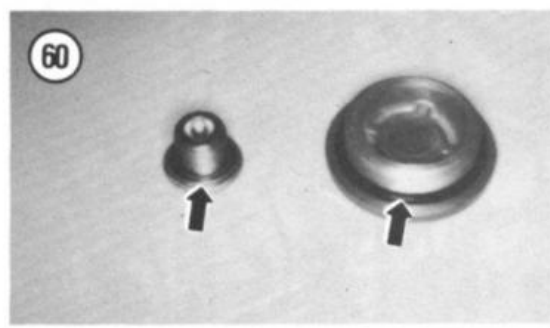
A cylinder at top dead center (TDC) of its compression stroke will have free play in both of its rocker arms, indicating that both the intake and exhaust valves are closed.

8. Using a 27 mm socket and wrench on the bolt on the alternator (**Figure 58**), rotate the rotor *counterclockwise* until the cylinder is at top dead center (TDC) on the compression stroke. To determine TDC for the cylinder, perform the following:
   a. Align the "T" mark on the rotor with the crankcase timing mark (**Figure 59**).
   b. Wiggle both sets of rocker arms. There should be free play in both rocker arms, indicating that both sets of the intake and exhaust valve sets are closed.
   c. If either the intake or exhaust rocker arms *do not* have free play, rotate the rotor *counterclockwise* an additional 360° and again align the "T" mark on the rotor with the crankcase timing mark (**Figure 59**).
   d. Again wiggle both sets of rocker arms. There should be free play in all 4 rocker arms, indicating that both sets of intake and exhaust valves are closed. The cylinder is now at top dead center (TDC) on the compression stroke.
9. On the right-hand side of the bike, loosen both locknuts on the decompression lever cable at the cylinder head cover bracket.
10. Rotate the adjuster in either direction until there is 0-2 mm (0-0.8 in.) clearance between the lever and the stop on the cylinder head cover.
11. Hold the adjuster in this position and tighten both locknuts securely.
12. Inspect the O-ring seal (**Figure 60**) on both timing hole covers for hardness or deterioration. Replace if necessary.
13. Install the 2 covers (**Figure 57**) into the timing holes on the left-hand crankcase cover.
14. Inspect the O-ring seals (**Figure 61**) on the valve adjuster covers for hardness or deterioration. Replace if necessary.
15. Install both valve adjuster covers onto the cylinder head cover and tighten the bolts securely.
16. Install the spark plug, frame side covers, seat and the fuel tank.





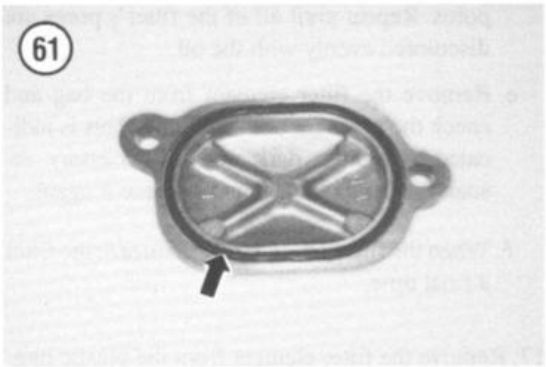


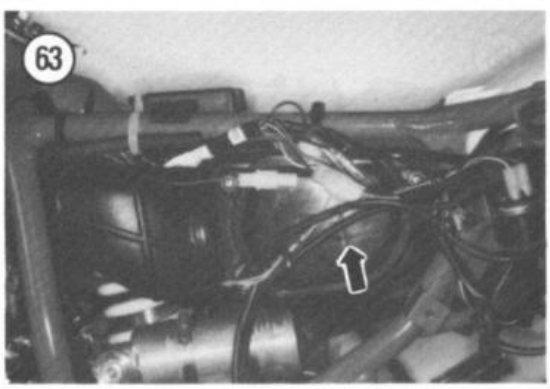


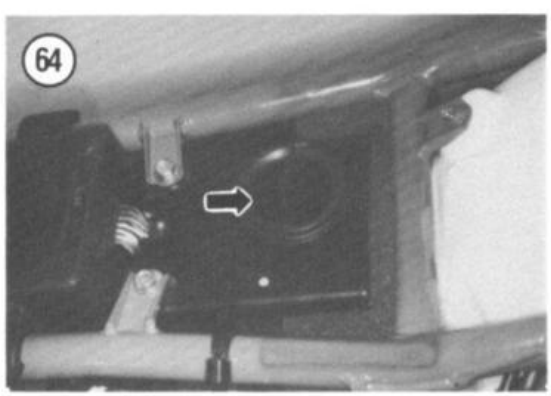
Air Filter
Removal/Cleaning/Installation

The air filter element should be removed, cleaned and re-oiled at intervals indicated in **Table 1**.

The air filter removes dust and abrasive particles from the air before it enters the carburetors and engine. Very fine particles that may enter into the







engine will cause rapid wear to the piston rings, cylinder and bearings and may clog small passages in the carburetors. Never run your Suzuki without the air filter element installed.

Proper air filter servicing can do more to insure long service from your engine than any other single item.

NOTE

This cleaning procedure covers the Suzuki factory installed air filter element. If you are using an accessory air filter, refer to the manufacturer's instructions for cleaning. Some accessory air filter elements cannot be cleaned—they must be replaced when they become dirty.

All models are equipped with foam air filter element. To work properly, the filter element must be properly, cleaned and oiled with 10W/40 motor oil or a *foam* air filter oil.

1. Remove the frame left-hand side cover (**Figure 62**).
2. Remove the seat as described in Chapter Thirteen.
3. Remove the special bolts securing the air filter cover (**Figure 63**), move the electrical wires out of the way and remove the cover.
4. Remove the inlet tube (**Figure 64**) from the top of the air box.
5. Reach down through the air box opening (**Figure 65**) and unscrew the wing bolt securing the air filter element.
6. Carefully pull the air filter element assembly out of the air box.
7. Clean the inside of the air box (**Figure 66**) with a clean shop rag soaked in solvent or soap and water.
8. After the air box has dried, coat the inside of the air box with a thin layer of wheel bearing grease. Apply the grease with your hands so that it covers all of the air box inside surfaces. The grease works like an additional filter and will help to absorb any dirt in the air box.

CAUTION

*Do **not** clean the air filter element with gasoline. Besides being an extreme fire hazard, gasoline will break down the seam glue used to hold the filter together. This will cause filter damage and allow unfiltered air to enter the engine.*

9. Separate the air filter element (A, **Figure 67**) from the element frame (B, **Figure 67**).

10. Fill a clean pan with a non-flammable solvent. If you are using an accessory air filter, the manufacturer may also sell a special air filter element cleaner and this product should be used. Check with your dealer.

11. Submerge the air filter element into the cleaning solution and gently work the cleaner into the element pores. Soak and squeeze (gently) the element to clean it.

CAUTION

Do not wring or twist the element when cleaning it. This harsh action could damage a filter pore or tear the filter loose at a seam. This would allow unfiltered air to enter the engine and cause severe and rapid engine wear.

12. Rinse the filter under warm water while soaking and gently squeezing it.

13. Repeat Step 11 and Step 12 two or three times or until there are no signs of dirt being rinsed from the filter.

14. After cleaning the filter element, inspect it. If torn or broken in any area it should be replaced. Do not run the engine with a damaged filter as it may allow dirt to enter the engine and cause severe engine wear.

15. Set the filter element aside and allow it to dry thoroughly.

CAUTION

A damp filter will not trap fine dust. Make sure the filter is completely dry before oiling it.

16. Properly oiling an air filter element is a messy job. You may want to wear a pair of disposable latex gloves when performing this procedure. Oil the filter as follows:

a. Purchase a box of gallon size clear reclosable storage bags. These bags can be used when cleaning the filter as well as for storing engine and carburetor parts during disassembly.

b. Place the cleaned filter element into a plastic storage bag.

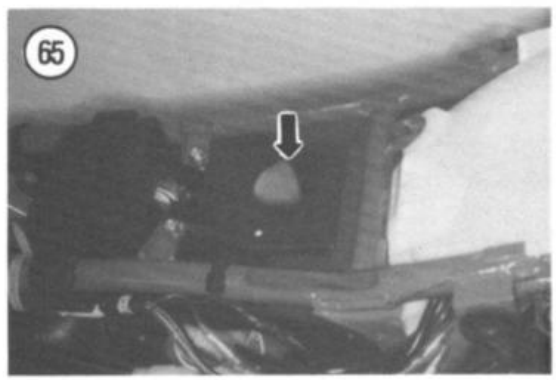
c. Pour 10W/40 motor oil or foam air filter oil onto the filter to soak it.

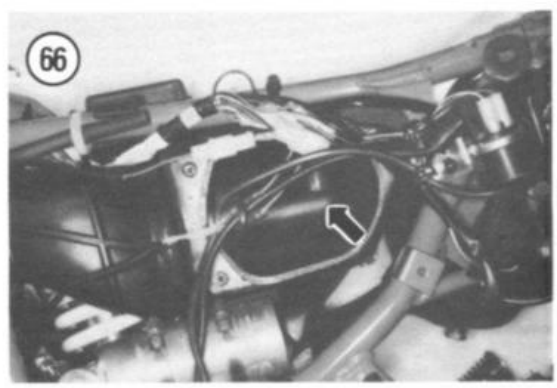
d. Gently squeeze and release the outside of the bag to soak the filter oil into the filter element's pores. Repeat until all of the filter's pores are discolored evenly with the oil.

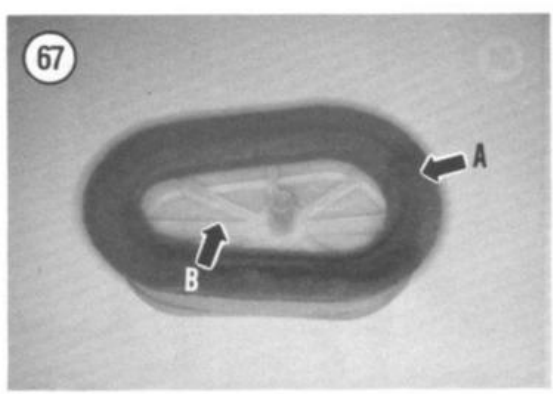
e. Remove the filter element from the bag and check the pores for uneven oiling. This is indicated by light or dark areas. If necessary, resoak the filter element and squeeze it again.

f. When the filter oiling is even, squeeze the filter a final time.

17. Remove the filter element from the plastic bag.







18. Install the air filter element onto the element frame. Make sure it fits on properly all the way around the perimeter.

19. Apply a coat of light weight grease to the filter's sealing surface (A, **Figure 67**).

20. Check the seal (**Figure 68**) on the air filter cover for wear or damage. The seal is a weak area as it is easily deformed and damaged. Replace the seal if necessary.

21. Carefully push the air filter element assembly into the housing air box.

22. Install and tighten the wing nut securing the air filter element.

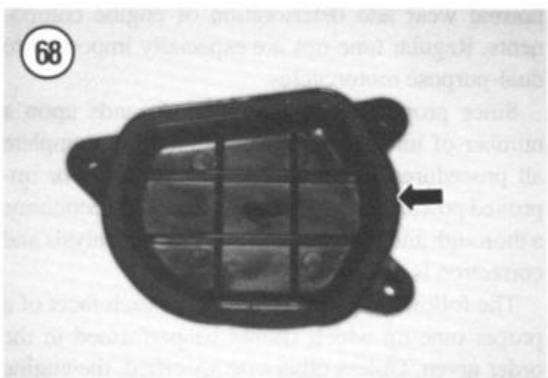
23. Install the inlet tube (**Figure 64**) into the top of the air box.

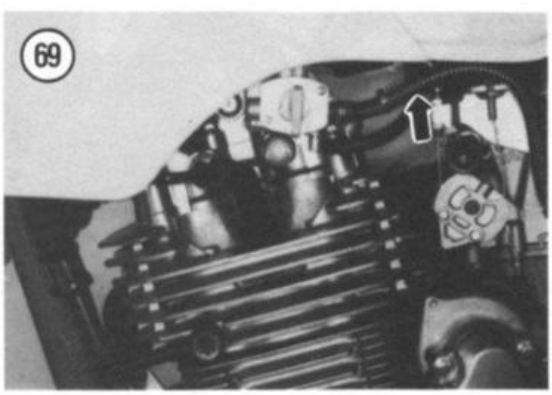
24. Install the air filter cover (**Figure 63**) and special bolts, tighten the bolts securely.

25. Install the seat and the frame's left-hand side cover.

26. Pour the left-over filter oil from the bag back into the bottle for reuse.

27. Dispose of the plastic bag safely.





Fuel Line Inspection

Inspect the fuel line from the fuel tank to the carburetor assembly (**Figure 69**). If it is cracked or starting to deteriorate it must be replaced. Make sure the small hose clamps are in place and holding securely. Also make sure that the overflow and vent tubes are in place and are not kinked.

WARNING

A damaged or deteriorated fuel line presents a very dangerous fire hazard to both the rider and the machine if fuel should spill onto a hot engine or exhaust pipe.

NOTE

If you have been experiencing fuel contamination that is plugging the jets in the carburetor (especially the pilot jet), install an inline fuel filter in the fuel line between the fuel tank and the carburetor. Use the stock Suzuki fasteners to hold the line to the filter. If the contamination problem is severe, you may want to flush the fuel tank before installing the filter.

Emission Control Hoses (California Models)

All DR250S and DR350S models originally sold in California are equipped with an evaporative emission control system. Refer to *Emission Control* in Chapter Eight for inspection procedures and additional information.

Wheel Bearings

The wheel bearings should be periodically checked for roughness or other damage. Factory equipped sealed bearings do not require periodic lubrication. However, if non-sealed bearings have been installed by a previous owner, they should be cleaned and repacked every six month or more often if the vehicle is operated often in water (especially salt water). Service procedures are covered in Chapter Ten (front) and Chapter Eleven (rear).

Steering Head Adjustment Check

Tapered roller bearings are installed in the upper and lower bearing mounting areas. A loose bearing

adjustment will hamper steering and cause premature bearing and race wear. In severe conditions, a loose bearing adjustment can cause loss of control. Steering head play should be checked often, especially after riding the bike off-road.

1. Place the bike on a stand so that the front wheel clears the ground.
2. Center the front wheel. Push lightly against the left handlebar grip to start the wheel turning to the right, then let go. The wheel should continue turning under its own momentum until the forks hit their stop. Try the same in the other direction.
3. If, with a light push in either direction, the front wheel will turn all the way to the top, the steering adjustment is not too tight.
4. Center the front wheel and kneel in front of it. Grasp the bottoms of the fork legs. Try to pull the forks toward you, and then try to push them toward the engine. If no play is felt, the steering adjustment is not too loose.
5. If the steering adjustment is too tight or too loose, readjust it as described under *Steering Adjustment* in Chapter Ten.

Handlebar

Inspect the handlebar weekly for any signs of damage. A bent or damaged handlebar should be replaced. The knurled section of the bars should be kept very rough. Keep the clamps clean with a wire brush. Any time that the bars slip in the clamps (like when you land flat and they move forward slightly) they should be removed and wire brushed clean to prevent small balls of aluminum from gathering in the clamps and reducing the grip surface area.

Spark Arrestor Cleaning

The spark arrestor should be cleaned at the interval listed in **Table 1**.

WARNING

To avoid burning your hands, do not perform this operation with the exhaust system hot. Work in a well-ventilated area (outside the garage area) that is free from fire hazards. Be sure to protect your eyes with safety glasses or goggles.

1. Remove the drain screw and gasket (**Figure 70**) from the end of the muffler.
2. Start the engine and rev it up a couple of times.
3. Continue to rev the engine until carbon stops coming out.
4. Turn the engine off.
5. Install a new gasket and reinstall the drain screw. Tighten the screw securely.

Nuts, Bolts and Other Fasteners

Constant vibration can loosen many of the fasteners on the motorcycle. Check the tightness of all fasteners, especially those on:

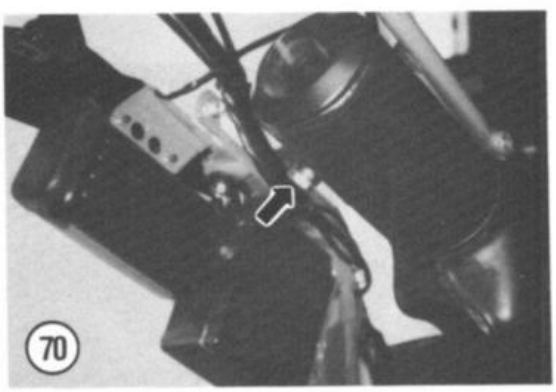
a. Engine mounting hardware.
b. Engine crankcase covers.
c. Handlebar and front forks.
d. Gearshift lever.
e. Kickstarter lever (models so equipped).
f. Brake pedal and lever.
g. Clutch lever.
h. Exhaust system.

ENGINE TUNE-UP

A tune-up consists of a series of inspections, adjustments and parts replacements to compensate for normal wear and deterioration of engine components. Regular tune-ups are especially important to dual-purpose motorcycles.

Since proper engine operation depends upon a number of interrelated system functions, complete all procedures as outlined in this section. For improved power, performance and operating economy, a thorough and systematic procedure of analysis and correction is necessary.

The following paragraphs discuss each facet of a proper tune-up which should be performed in the order given. Unless otherwise specified, the engine



should be thoroughly cool before starting any tune-up procedure.

NOTE

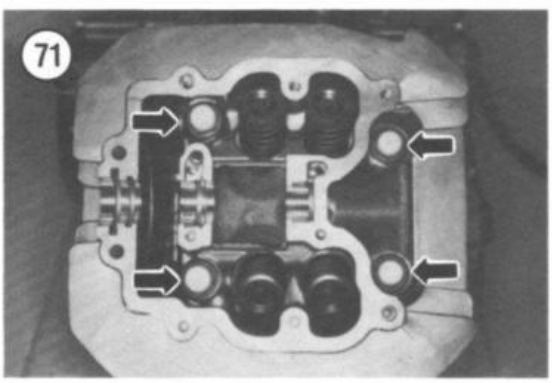
It is a good idea to start the engine after each one of the tune-up procedures is completed and make sure it runs okay. If for some reason, the procedure was not done correctly or a faulty new part(s) was installed, you can then concentrate on that specific procedure and part(s) and correct the problem. If you wait until all of the tune-up procedures are completed and then the bike runs worse or does not start at all, then you have to narrow it down to which one of the procedures or parts is causing the problem.

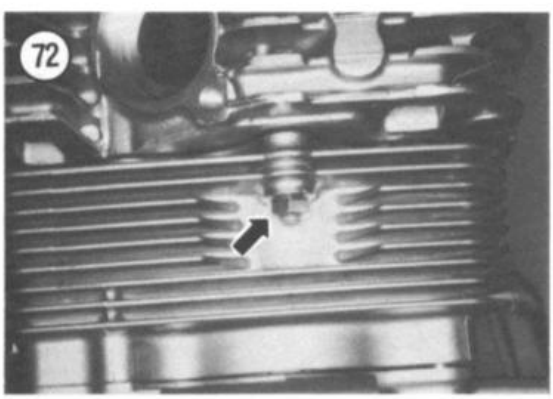
A tune-up consists of the following:

a. Tightening the cylinder head bolts and nuts, cylinder nuts, exhaust pipe bolts and muffler connections.

b. Valve clearance check and adjustment.

c. Carburetor check and adjustment.





To perform a tune-up on your Suzuki DR, you will need the following tools and equipment:

a. Spark plug wrench.

b. Ratchet and assorted sockets.

c. Allen wrenches.

d. Flat feeler gauge.

e. Spark plug wire feeler gauge and gapper tool.

f. Portable tachometer.

Cylinder Head Bolts and Nuts, Cylinder Nuts, Exhaust Pipe Bolts and Muffler Connections Tightening

Cylinder head bolts and nuts, cylinder nuts tightening

The cylinder head bolt and nut tightening procedure must be made with the engine cool, at room temperature. Preferably let the bike sit overnight, then tighten them the first thing in the morning.

NOTE

The following figures are shown with the engine removed and partially disassembled for clarity. All bolts and nuts can be tightened with the engine in the frame even though some may be difficult to reach.

1. Remove the cylinder head cover as described in Chapter Four.

2. First loosen the cylinder head bolts (**Figure 71**) in a crisscross pattern, then loosen the front (**Figure 72**) and rear (**Figure 73**) cylinder head-to-cylinder nuts.

3. Tighten the cylinder head bolts (**Figure 71**) in a crisscross pattern to the torque specification listed in **Table 5**.

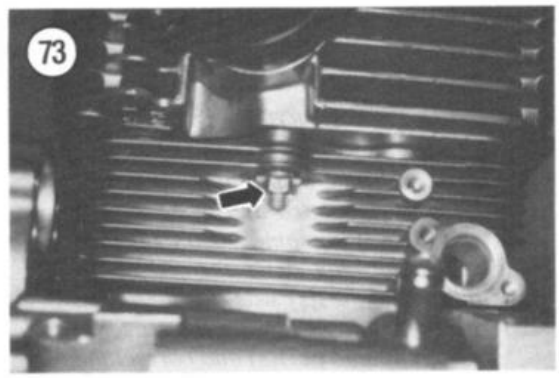
4. Tighten the front (**Figure 72**) and rear (**Figure 73**) cylinder head-to-cylinder nuts to the torque specification listed in **Table 5**.

5. Install the cylinder head cover as described in Chapter Four.

6. Tighten the cylinder-to-crankcase nuts (**Figure 74**) to the torque specification listed in **Table 5**.

Exhaust pipe bolts and muffler connections tightening

1. Tighten the exhaust pipe flange-to-cylinder head bolts (**Figure 75**) to the torque specification listed in **Table 5**.
2. Tighten the exhaust pipe-to-muffler clamp bolt (**Figure 76**) to the torque specification listed in **Table 5**.
3. Tighten the muffler mounting bolts (**Figure 77**) to the torque specification listed in **Table 5**.

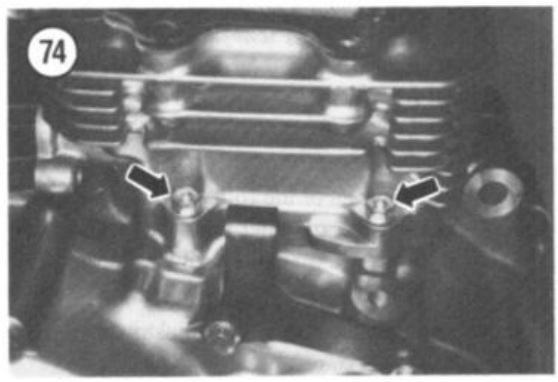


Valve Clearance Measurement

Valve clearance measurement must be made with the engine cool, at room temperature. Preferably let the bike sit overnight and check the valve clearance the first thing in the morning.

The intake valves are located at the rear of the cylinder head and the exhaust valves are located at the front. The correct valve clearances are as follows:

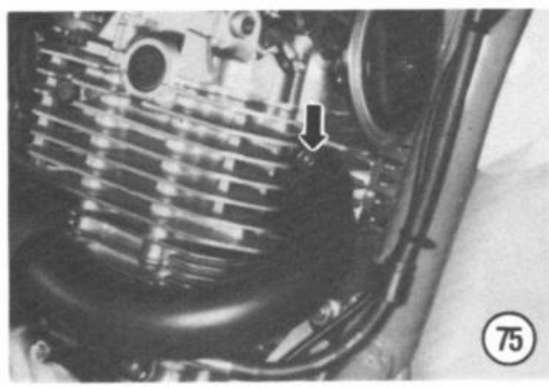
a. Intake valves: 0.05-0.10 mm (0.002-0.004 in.).
b. Exhaust valves: 0.08-0.13 mm (0.003-0.005 in.).



1. Place the bike on the sidestand.
2. Remove the fuel tank as described in Chapter Eight.

CAUTION

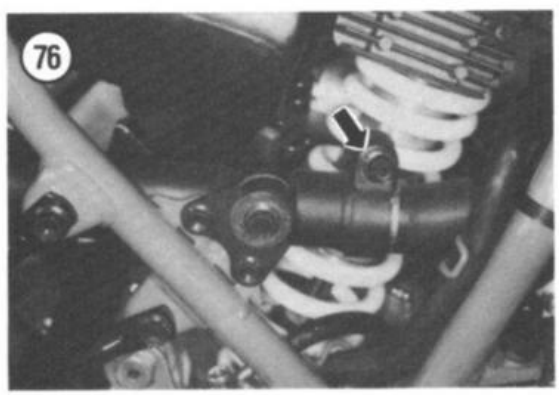
*To prevent expensive engine damage, refer to **CAUTIONS** under **Spark Plug Removal** in this chapter.*

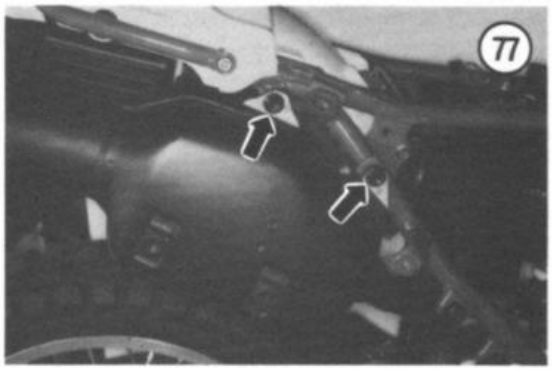


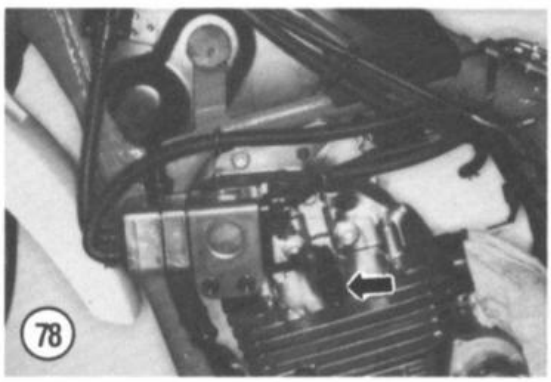
3. Remove the spark plug (**Figure 78**) as described in this chapter. This will make it easier to rotate the engine by hand.

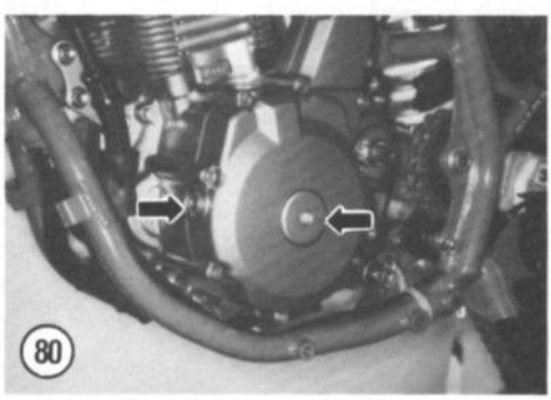
NOTE

*The decompression lever adjustment procedure says to adjust the valves prior to adjusting the decompression lever. But, in order to correctly adjust the exhaust valves, the decompression lever shaft must **not** be touching the exhaust valve rocker arm. If the decompression lever shaft is pushing down on the rocker arm by even a slight amount, it will decrease the valve-to-rocker arm clearance and the valve clearance adjustment procedure will be faulty.*









4. On models so equipped, check the decompression lever clearance as described in this chapter. If the clearance is incorrect, loosen the locknuts and turn the adjuster until there is *no clearance* between the lever and the boss on the cylinder head cover. This will ensure that the lever shaft is *not touching* the exhaust valve rocker arm.

5. Remove both valve adjuster covers (**Figure 79**) from the cylinder head cover.

6. Place a drip pan under the left-hand crankcase cover as some oil may drain out when the timing hole covers are removed in the next step.

7. Remove the 2 covers (**Figure 80**) from the timing holes on the left-hand crankcase cover.

NOTE

A cylinder at top dead center (TDC) of its compression stroke will have free play in all of its rocker arms, indicating that all the intake and exhaust valves are closed.

8. Use a 27 mm socket and wrench on the nut (**Figure 81**) on the alternator, rotate the rotor *counterclockwise* until the cylinder is at top dead center (TDC) on the compression stroke. To determine TDC for the cylinder, perform the following:

a. Align the "T" mark on the rotor with the crankcase timing mark (**Figure 82**).
b. Wiggle both rocker arms. There should be free play in both rocker arms, indicating that both the intake and exhaust valve sets are closed.
c. If either the intake or exhaust rocker arms *do not* have free play, rotate the rotor *counterclockwise* an additional 360° and again align the "T" mark on the rotor with the crankcase timing mark (**Figure 82**).
d. Again wiggle both rocker arms. There should be free play in both rocker arms, indicating that both sets of intake and exhaust valves are closed. The cylinder is now at top dead center (TDC) on the compression stroke.

9. With the engine in this position, check the clearance of all of the intake and exhaust valves.

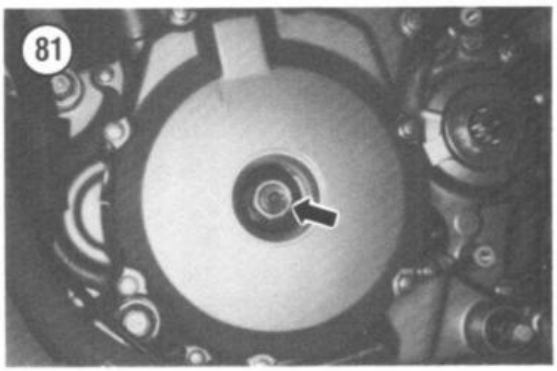
10. Check the clearance by inserting a flat feeler gauge between the rocker arm and the valve stem (**Figure 83**). When the clearance is correct, there will be a slight drag on the feeler gauge when it is inserted and withdrawn. Measure the valve clearance for both the intake and exhaust valves.

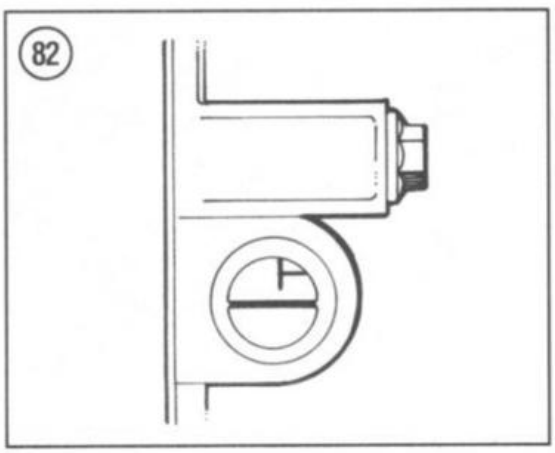
11. To adjust the valve clearance, perform the following:
    a. Loosen the valve adjuster locknut (A, **Figure 84**) with a wrench and turn the adjuster (B, **Figure 84**) either in or out until there is a slight drag on the feeler gauge.
    b. Hold the adjuster with the wrench and tighten the locknut securely.
    c. Recheck the clearance to make sure the adjuster did not turn while tightening the locknut. Readjust if necessary.
12. Repeat Step 10 and Step 11 for all 4 valves.
13. After all valve clearances have been adjusted, using the wrench on the alternator rotor bolt, rotate the engine several complete revolutions to seat all components.
14. Reinspect all valve clearances as described in this procedure. If any of the clearances are still not within specification, repeat this procedure until all clearances are correct.
15. Adjust the decompression cable as described in this chapter.
16. Inspect the O-ring seal (**Figure 85**) on both timing hole covers for hardness or deterioration. Replace if necessary.
17. Install the 2 covers (**Figure 80**) into the timing holes on the left-hand crankcase cover.
18. Inspect the O-ring seals (**Figure 86**) on the valve adjuster covers for hardness or deterioration. Replace if necessary.
19. Apply a light coat of multipurpose grease to the O-ring seals and install both valve adjuster covers onto the cylinder head cover. Tighten the bolts securely.
20. Install the spark plug.
21. Install the fuel tank as described in Chapter Eight.
22. Check the engine oil level and top off if necessary as described in this chapter.
23. Start the bike and make sure it runs correctly.

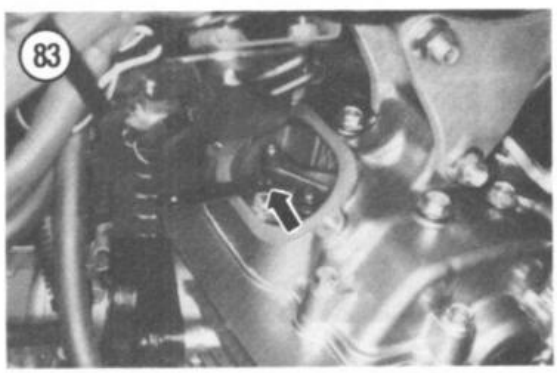
Correct Spark Plug Heat Range

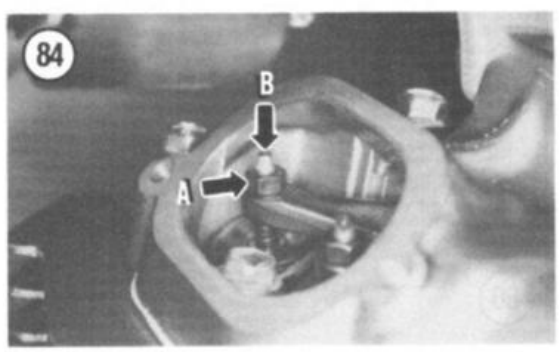
The proper spark plug is important in obtaining maximum performance and reliability. The condition of a used spark plug can tell a trained mechanic a lot about engine condition and carburetion.

Select a plug of the heat range designed for the loads and conditions under which the bike will be









run. Use of incorrect heat ranges can cause a seized piston, scored cylinder wall, or damaged piston crown.

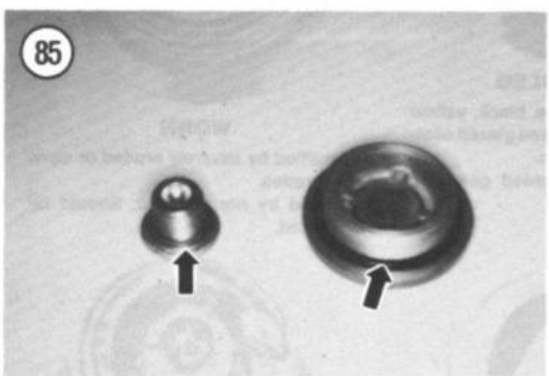
In general, use a hot plug for low speeds and low temperatures. Use a cold plug for high speeds, high engine loads and high temperatures. The plug should operate hot enough to burn off unwanted deposits, but not so hot that they burn themselves or cause preignition. A spark plug of the correct heat range will show a light tan color on the portion of the insulator within the cylinder after the plug has been in service. See **Figure 87**.

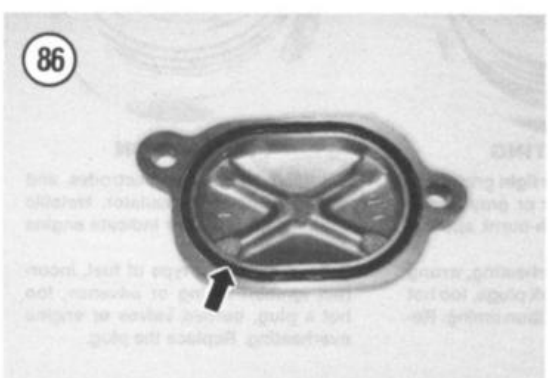
The reach (length) of a plug is also important. A longer than normal plug could interfere with the piston, causing permanent and severe damage. Refer to **Figure 88**.

The standard heat range spark plug is listed in **Table 6**.

Spark Plug Removal

1. Remove the fuel tank as described in Chapter Eight. This is necessary to gain easy access to the spark plug.





2. Grasp the spark plug lead (**Figure 78**) as near the plug as possible and pull it off the plug. If it is stuck to the plug, rotate it slightly to break it loose.

CAUTION

When the spark plug is removed, dirt surrounding the plug can fall into the spark plug hole. This can cause expensive engine damage.

3. Blow away any dirt that has accumulated next to the spark plug base with compressed air. If you don't have an air compressor, you can purchase a can of compressed inert gas from most photo supply stores.

NOTE

If the plug is difficult to remove, apply penetrating oil, like WD-40 or Liquid Wrench, around the base of the plug and let it soak in about 10-20 minutes.

4. Remove the spark plug with an 18 mm spark plug wrench.
5. Inspect the plug carefully. Look for a broken center porcelain, excessively eroded electrodes and excessive carbon or oil fouling.

Gapping and Installing the Plug

A new spark plug should be carefully gapped to ensure a reliable, consistent spark. You must use a special spark plug tool with a wire gauge.

1. Remove the new spark plug from the box and check the gap.
2. Insert a wire feeler gauge between the center and side electrode (**Figure 89**). The correct gap is listed in **Table 6**. If the gap is correct, you will feel a slight drag as you pull the wire through. If there is no drag, or the gauge won't pass through, bend the side electrode with the gapping tool (**Figure 90**) to set the proper gap. Remeasure with the wire gauge.

CAUTION

Never try to close the electrode gap by tapping the spark plug on a solid surface. This can damage the plug internally. Always use the special tool to open or close the gap.

3. Check the spark plug hole threads and clean with an appropriate size spark plug chaser, if necessary, before installing the plug. This will remove any corrosion, carbon guild-up or minor flaws from the

(87)

SPARK PLUG CONDITION

NORMAL

- Identified by light tan or gray deposits on the firing tip.
- Can be cleaned.

GAP BRIDGED

- Identified by deposit buildup closing gap between electrodes.
- Caused by oil or carbon fouling. If deposits are not excessive, the plug can be cleaned.

OIL FOULED

- Identified by wet black deposits on the insulator shell bore and electrodes.
- Caused by excessive oil entering combustion chamber through worn rings and pistons, excessive clearance between valve guides and stems or worn or loose bearings. Can be cleaned. If engine is not repaired, use a hotter plug.

CARBON FOULED

- Identified by black, dry fluffy carbon deposits on insulator tips, exposed shell surfaces and electrodes.
- Caused by too cold a plug, weak ignition, dirty air cleaner, too rich a fuel mixture or excessive idling. Can be cleaned.

LEAD FOULED

- Identified by dark gray, black, yellow or tan deposits or a fused glazed coating on the insulator tip.
- Caused by highly leaded gasoline. Can be cleaned.

WORN

- Identified by severely eroded or worn electrodes.
- Caused by normal wear. Should be replaced.

FUSED SPOT DEPOSIT

- Identified by melted or spotty deposits resembling bubbles or blisters.
- Caused by sudden acceleration. Can be cleaned.

OVERHEATING

- Identified by a white or light gray insulator with small black or gray brown spots and with bluish-burnt appearance of electrodes.
- Caused by engine overheating, wrong type of fuel, loose spark plugs, too hot a plug or incorrect ignition timing. Replace the plug.

PREIGNITION

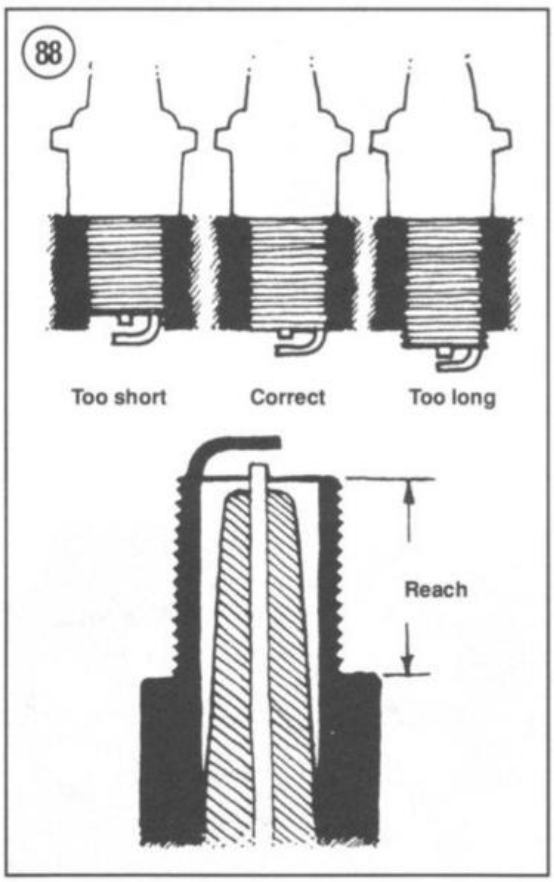
- Identified by melted electrodes and possibly blistered insulator. Metallic deposits on insulator indicate engine damage.
- Caused by wrong type of fuel, incorrect ignition timing or advance, too hot a plug, burned valves or engine overheating. Replace the plug.

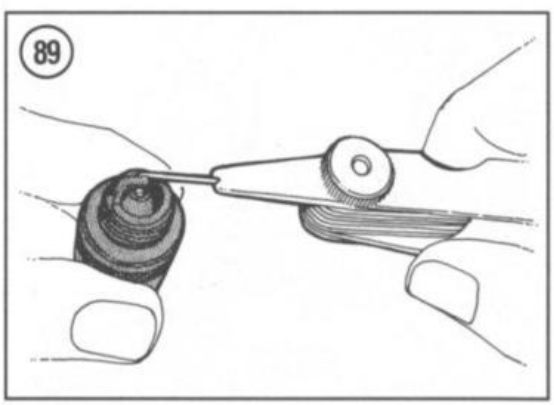
threads. Coat the chaser threads with grease to catch chips or foreign matter. Use care to avoid cross-threading.

4. Apply a thin film of an anti-seize compound to the spark plug threads.

NOTE

The spark plug well is too deep and narrow to hand-hold the spark plug and get it started by hand. The piece of vinyl tube used in Step 5 will still give you "the feel" of starting the plug by hand to avoid cross-threading it.





5. Attach a section of vinyl tubing onto the end of the spark plug and use this tubing to install the spark plug into the cylinder head. Screw the plug in by hand until it seats. Very little effort is required. If force is necessary, you have the plug cross-threaded. Unscrew it and try again.

6. Use a spark plug wrench and tighten the plug an additional 1/4 to 1/2 turn after the gasket has made contact with the head. If you are installing an old, regapped plug and reusing the old gasket, only tighten an additional 1/4 turn.

NOTE

Do not overtighten. This will only squash the gasket and destroy its sealing ability.

7. Install the spark plug wire. Make sure it is on tight.
8. Install the fuel tank as described in Chapter Eight.

Reading Spark Plugs

Much information about engine and spark plug performance can be determined by careful examination of the spark plug. This information is more valid after performing the following steps.

1. Ride the bike a short distance at full throttle in any gear.
2. Push the engine stop switch to the OFF position before closing the throttle and simultaneously pull in the clutch or shift to neutral; coast and brake to a stop.
3. Remove the spark plug and examine it. Compare it to **Figure 87**:
   a. If the insulator is white or burned, the engine is running hot. If you changed the spark plug, make sure the new plug has the correct heat range.
   b. A too-cold plug will have sooth or oily deposits.
   c. If the plug has a light tan or gray colored deposit and no abnormal gap wear or electrode erosion is evident, the plug and the engine are running properly.
   d. If the plug exhibits a black insulator tip, damp oily film over the firing end, and a carbon layer over the entire nose, it is oil fouled. An oil

fouled plug can be cleaned, but it is better to replace it.

NOTE

A too-hot or to too-cold plug reading is also an indication that the engine is not operating correctly. If the correct spark plug is installed for the altitude that you are riding in, one of the engine systems is malfunctioning or the system is tuned incorrectly. Refer to Chapter Two.

Carburetor Idle Speed Adjustment

Proper idle speed is a balance between a low enough idle to give adequate compression braking and a high enough idle to prevent engine stalling (if desired). The idle air/fuel mixture affects transition from idle to part throttle openings.

1. Make sure that the throttle cable free play is adjusted correctly as described in this chapter.
2. Start the engine and allow it to warm up for 2-3 minutes.
3. Connect a portable tachometer following the manufacturer's instructions.

4A. On DR250S and DR350S models, turn the throttle stop screw to achieve the idle speed listed in **Table 6**. Refer to **Figure 91** or **Figure 92**.

NOTE

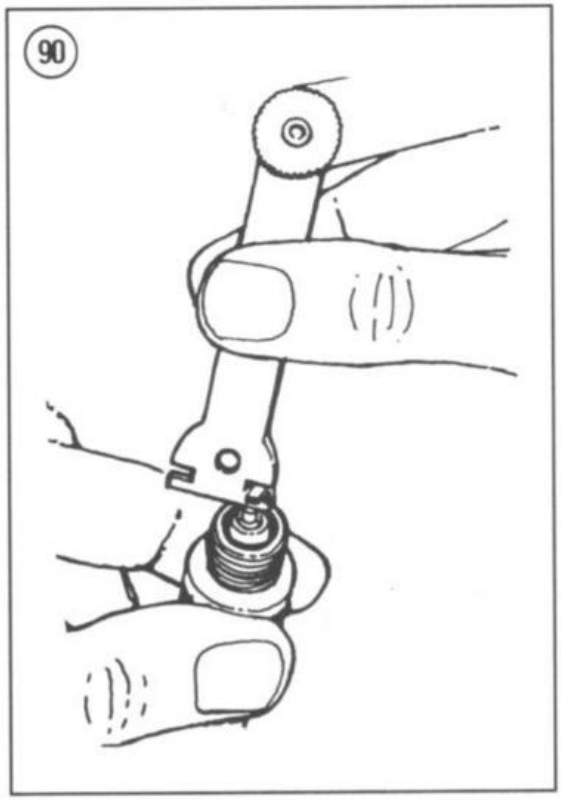
***Figure 93** and **Figure 94** are shown with the carburetor removed from the engine for clarity. Do not remove the carburetor for this procedure.*

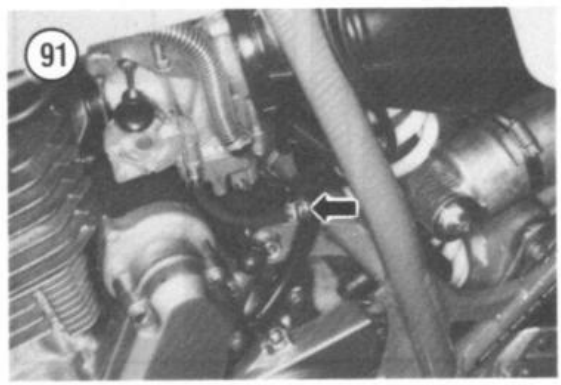
4B. On DR250 and DR350 models, perform the following:

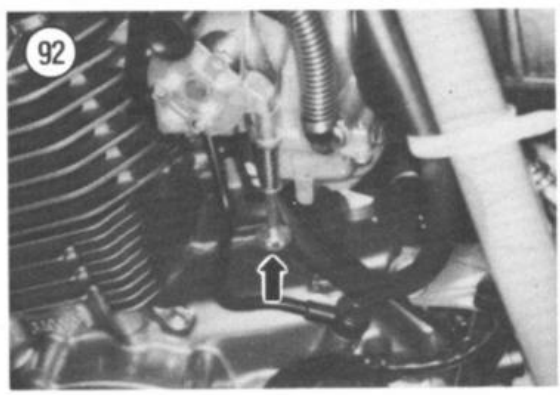
a. Turn the throttle stop screw (**Figure 93**) to achieve the idle speed listed in **Table 6**.
b. Turn the pilot screw (**Figure 94**) in or out 1/2 turn from the standard setting to achieve the highest idle speed.

WARNING

With the engine idling, move the handlebar from side to side. If idle speed increases during this movement, the throttle cable(s) needs adjusting or it may be incorrectly routed through the frame. Correct this problem immediately. Do not ride the bike in this unsafe condition.







5. Shut the engine off and disconnect the tachometer.

STORAGE

Several months of inactivity can cause serious problems and a general deterioration of your Suzuki DR. This is especially true in areas of weather extremes. During the winter months it is advisable to specially prepare the bike for lay-up.

Selecting a Storage Area

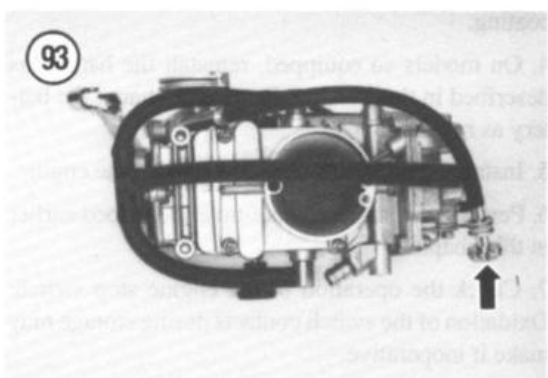
Most riders store their bikes in their home garages. If you do not have a home garage, facilities suitable for long-term motorcycle storage are readily available for rent or lease in most areas. In selecting a building, consider the following points.

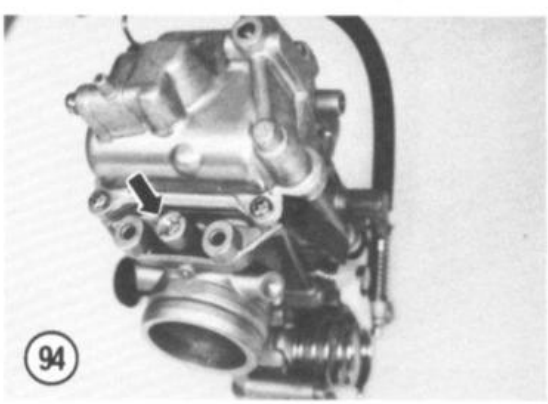
1. The storage area must be dry, free from dampness and excessive humidity. Heating is not necessary, but the building should be well insulated to minimize extreme temperature variations.

2. Buildings with large window areas should be avoided, or such windows should be masked (also a good security measure) if direct sunlight can fall on the bike.

3. Buildings in industrial areas, where factories are liable to emit corrosive fumes, are not desirable, nor are facilities near bodies of salt water.

4. The area should be selected to minimize the possibility of loss from fire, theft or vandalism. The area should be fully insured, perhaps with a package covering fire, theft, vandalism, weather and liability. Talk this over with your insurance agent and get approval on these matters. The building should be fireproof and items such as the security of doors and windows, alarm facility and proximity of police should be considered.





Preparing Bike for Storage

Careful preparation will minimize deterioration and make it easier to restore the bike to service later. Use the following procedure.

1. Wash the bike completely. Make certain to remove all dirt in all the hard to reach parts like the cooling fins on the cylinder head and cylinder. Tip the bike from side-to-side to drain off any water that may be trapped on horizontal surfaces.

2. Completely dry all parts of the bike to remove all moisture. Wax all painted and polished surfaces, including any chromed areas.

3. Run the bike for about 20-30 minutes to warm up the oil. Drain the oil, as described in this chapter, regardless of the time since the last oil change. Refill with the normal quantity and type of engine oil.

4. Fill the fuel tank to the top mixed with the amount of gasoline stabilizer recommended by the stabilizer manufacturer.

5. Drain the old gasoline from the carburetor. Start the engine and allow it to run until the new gasoline with the added stabilizer fills the float bowl. Shut the engine off.

6. Lubricate the drive chain and control cables; refer to specific procedures in this chapter.

7. Remove the spark plug and add about one teaspoon of engine oil into the cylinder. Reinstall the spark plug and turn the engine with the kickstarter, or starter, to distribute the oil to the cylinder walls and piston. Depress the engine kill switch while doing this to prevent it from starting.

8. Stuff an oily rag into the muffler outlet. Then tape or tie a plastic bag over the end of the muffler to prevent the entry of moisture.

9. Check the tire pressure, inflate to the correct pressure and move the bike to the storage area.
10. Apply a protective tire dressing onto the side wall of the tires. Do not apply to the tread surface as this will make them slick.
11. Place the bike securely on a stand or wood blocks with both wheels off the ground.
12. On models so equipped, remove the battery as described in this chapter. Coat the battery cables with a petroleum jelly such as Vaseline or a light mineral grease. Store the battery in a warm an accessible area so that it can be checked monthly.
13. Cover the bike with a tarp, blanket or heavy plastic drop cloth. Place this cover over the bike mainly as a dust cover—do not wrap it tightly, especially any plastic material, as it may trap moisture causing condensation. Leave room for air to circulate around the bike.

Inspection During Storage

Try to inspect the bike weekly while in storage. Any deterioration should be corrected as soon as possible. For example, if corrosion of bright metal parts is observed, cover them with a light coat of grease or silicone spray after a thorough polishing.

Turn the engine over a couple of times. Don't start it; use the kickstarter, or on models with no kickstarter, shift the transmission in gear and roll the bike for a distance, and hold the kill switch on. Pump the front forks to keep the seals lubricated.

Once a month, check the battery as described in this chapter. Service as required.

Restoring Bike to Service

A bike that has been properly prepared and stored in a suitable area requires only light maintenance to restore to service. It is advisable, however, to perform a spring tune-up.

1. Before removing the bike from the storage area, reinflate the tires to the correct pressures. Air loss during storage may have nearly flattened the tires, and moving the bike can cause damage to tires, tubes and rims.

2. When the bike is brought to the work area, turn the fuel shutoff valve to the OFF position, and refill the fuel tank. Open the drain screw in the float bowl of the carburetor, turn the fuel shutoff valve to the ON position and allow several cups of fuel to pass through the fuel system. Turn the fuel shutoff valve to the OFF position and tighten the drain screw in the float bowl.

WARNING

Place a metal container under the carburetor to catch all expelled fuel—this presents a real fire danger if allowed to drain onto the bike and the floor. Dispose of the fuel properly.

3. Remove the spark plug and squirt a small amount of fuel into the cylinder to help remove the oil coating.

4. On models so equipped, reinstall the battery as described in this chapter. Service or charge the battery as required.

5. Install a fresh spark plug and start up the engine.

6. Perform the standard tune-up as described earlier in this chapter.

7. Check the operation of the engine stop switch. Oxidation of the switch contacts during storage may make it inoperative.

8. Clean and test ride the motorcycle.

Table 1 MAINTENANCE SCHEDULE*

DR250 AND DR350	
Prior to every ride	Check air filter element condition, clean if necessary and reoil. Check and adjust drive chain slack. Check drive chain for excessive wear. Lubricate drive chain. Inspect tires, rims and spoke nipples for damage. Check tire inflation pressure.
Every 30 hours of operation	Tighten cylinder head bolts and nuts, exhaust pipe and muffler bolts and nuts. Check spark plug gap and condition. Clean spark arrestor. Check and adjust decompression lever clearance (models so equipped). Check engine external oil hoses and fittings for damage or leakage. Check and adjust carburetor idle speed. Check fuel lines. Replace if necessary. Check and adjust clutch cable free play. Check and adjust rear brake pedal free play. Check front and rear brake pad wear. Check brake hoses for damage or leakage. Replace if necessary. Check brake fluid level in front and rear reservoirs. Check and tighten all chassis bolts and nuts.
Every 60 hours of operation	Check and adjust valve clearance. Replace the spark plug. Change engine oil and filter. Clean oil strainer on frame. Check rear suspension mounting hardware for tightness. Lubricate control cables. Lubricate swing arm pivot shaft. Lubricate suspension link pivot shafts. Lubricate brake, clutch, decompression lever (models so equipped) pivot bolts. Lubricate sidestand pivot shaft. Lubricate kickstarter crank boss (models so equipped). Change front fork oil. Check front steering bearing play and lubricate. Check wheel bearing condition. Lubricate if necessary. Check shock absorber operation and for leakage.
Every 2 years	Replace front and rear brake fluid and bleed brakes.
Every 4 years	Replace all brake hoses. Replace all fuel hose(s).
DR250S AND DR350S	
Every 600 miles (1,000 km) or 3 months	Tighten cylinder head bolts and nuts, exhaust pipe and muffler bolts and nuts. Check and adjust valve clearance.

(continued)

Table 1 MAINTENANCE SCHEDULE (continued)

Every 600 miles (1,000 km) or 3 months (continued)	Check and adjust decompression lever clearance (models so equipped). Change engine oil and filter. Check engine external oil hoses and fittings for damage or leakage. Clean oil strainer on frame. Check and adjust carburetor idle speed. Check fuel lines. Replace if necessary. Check and adjust clutch cable free play. Check and adjust drive chain slack. Check drive chain for excessive wear. Clean and lubricate drive chain. Check and adjust rear brake pedal free play. Check front and rear brake pad wear. Check brake fluid level in front and rear reservoirs. Inspect tires, rims and spoke nipples for damage. Check tire inflation pressure. Check front fork operation and for leakage. Check front steering bearing play and lubricate. Check wheel bearing condition. Lubricate if necessary. Check shock absorber operation and for leakage. Check and tighten all chassis bolts and nuts. Check sidestand switch operation. Lubricate control cables. Lubricate swing arm pivot shaft. Lubricate suspension link pivot shafts. Lubricate brake, clutch, decompression lever (models so equipped) pivot bolts. Lubricate sidestand pivot shaft. Lubricate kickstarter crank boss (models so equipped).
Every 2,000 miles (3,000 km)	Check air filter element condition, clean and reoil.
Every 3,000 miles (5,000 km) or 15 months	Check battery charge. Check battery terminals for corrosion. Clean spark arrestor. Check spark plug gap and condition. Check crankcase ventilation system hoses.
Every 6,000 miles (10,000 km) or 30 months	Replace the spark plug.
Every 2 years	Replace front and rear brake fluid and bleed brakes. Change front fork oil.
Every 4 years	Replace all brake hoses. Replace all fuel hose(s). Replace all evaporation control vapor hoses (California models).

* This Suzuki factory maintenance schedule should be considered as a guide to general maintenance and lubrication intervals. Harder than normal use and exposure to mud, water, sand, high humidity, etc. will dictate more frequent attention to most maintenance items.

Table 2 TIRE INFLATION PRESSURE

	Front tire	Rear tire
Tire pressure		
DR250 and DR350	14 psi (100 kPa)	14 psi (100 kPa)
DR250S and DR350S		
Solo riding	22 psi (147 kPa)	22 psi (147 kPa)
Dual riding	22 psi (147 kPa)	25 psi (175 kPa)

Table 3 RECOMMENDED LUBRICANTS AND FUEL

Engine oil	4-cycle oil, SAE 10W/40 API SE or SF motor oil
Front fork oil	10 wt fork oil
Air filter	SAE 10W/40 motor oil or foam air filter oil
Drive chain	Chain lube recommended for O-ring drive chains or SAE 30W/50 engine oil
Control cables	Cable lube
Control lever pivots	10W/30 motor oil
Swing arm pivot shaft	Lithium base waterproof wheel bearing grease
Suspension pivot shaft	Molybdenum disulfide grease
Steering head bearings	Lithium base waterproof wheel bearing grease
Fuel	Regular unleaded grade—research octane 87 or higher
Brake fluid	DOT 4

Table 4 APPROXIMATE REFILL CAPACITIES

Engine oil	
Periodic oil change	1,700 ml (1.8 U.S. qt./1.5 Imp. qt.)
With filter change	1,900 ml (2.0 U.S. qt./1.7 Imp. qt.)
Engine rebuild	2,100 ml (2.2 U.S. qt./1.8 Imp. qt.)
Front fork (each leg)	
DR250 and DR350	586 ml (19.8 U.S. oz./20.6 Imp. oz.)
DR250S and DR350S	544 ml (18.4 U.S. oz./19.2 Imp. oz.)
Front fork oil level	
DR250 and DR350	145 mm (5.7 in.)
DR250S and DR350S	170 mm (6.7 in.)
Fuel tank	
DR250 and DR350	
Total	9.5 liters (2.5 U.S. gal./2.1 Imp. gal.)
Reserve	1.8 liters (0.5 U.S. gal./0.4 Imp. gal.)
DR250S and DR350S	
49-state and U.K.	
Total	9.0 liters (2.4 U.S. gal./2.0 Imp. gal.)
Reserve	1.5 liters (0.4 U.S. gal./0.3 Imp. gal.)
California	
Total	8.0 liters (2.1 U.S. gal./1.8 Imp. gal.)
Reserve	1.5 liters (0.4 U.S. gal./0.3 Imp. gal.)

Table 5 MAINTENANCE AND TUNE UP TIGHTENING TORQUES

Item	N•m	ft.-lb.
Crankcase oil drain plug	18-23	13-16.5
Frame oil drain plug	15-20	11-14.5
Oil strainer	25-30	18-21.5
Front axle	50-80	36-58
Rear axle nut	85-115	61.5-83
Front fork cap bolt	30-40	21.5-29
Cylinder head bolts	35-40	25.5-29
Cylinder-to-cylinder head nuts	23-27	16.5-19.5
Cylinder nuts	23-27	16.5-19.5
Exhaust pipe flange bolts	18-28	13-20
Exhaust pipe-to-muffler clamp bolt	18-28	13-20
Muffler mounting bolts	23-28	16.5-20

Table 6 TUNE-UP SPECIFICATIONS

Valve clearance (cold)	
Intake	0.05-0.10 mm (0.002-0.004 in.)
Exhaust	0.08-0.13 mm (0.003-0.005 in.)
Spark plug	
Type	NGK DPR9EA-9 or ND X27EPR-U9
Gap	0.8-0.9 mm (0.03-0.04 in.)
Ignition timing	"T" mark fixed
Idle speed	1,400-1,600 rpm
Drive chain free play	
DR250 and DR250S	20-40 mm (0.8-1.6 in.)
DR350 and DR350S	25-40 mm (1.0-1.6 in.)

CHAPTER FOUR

ENGINE TOP END

The engine is an air-cooled single overhead cam four-valve single. The four valves are operated by a single chain-driven camshaft.

This chapter provides complete service and overhaul procedures, including information for disassembly, removal, inspection, service and reassembly of the engine top end components. These include the cylinder head cover, camshaft, valves, cylinder head, piston, piston rings and the cylinder.

Before starting any work, read the service hints in Chapter One. You will do a better job with this information fresh in your mind.

Throughout the text there is frequent mention of the right-hand and left-hand side of the engine. This refers to the engine as it sits in the bikes frame, *not* as it sits on your workbench. "Right-" and "left-hand" refers to a rider sitting on the seat facing forward.

Table 1 lists general engine specifications and **Table 2** lists engine service specifications. **Tables 1-3** are at the end of the chapter.

ENGINE PRINCIPLES

Figure 1 explains basic four-stroke engine operation. This will be helpful when troubleshooting or repairing your engine.

SERVICING ENGINE IN FRAME

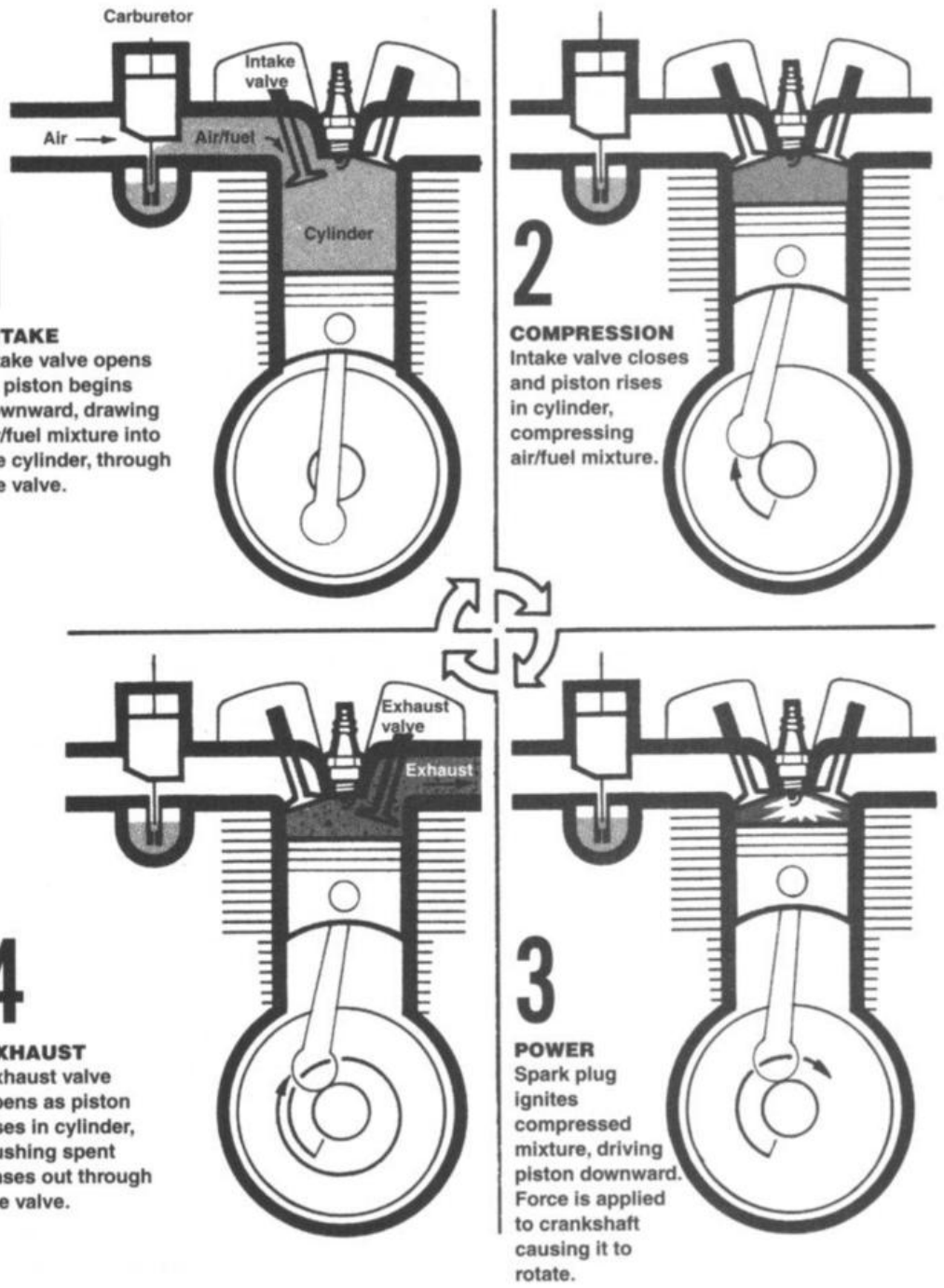
Many components can be serviced while the engine is mounted in the frame:

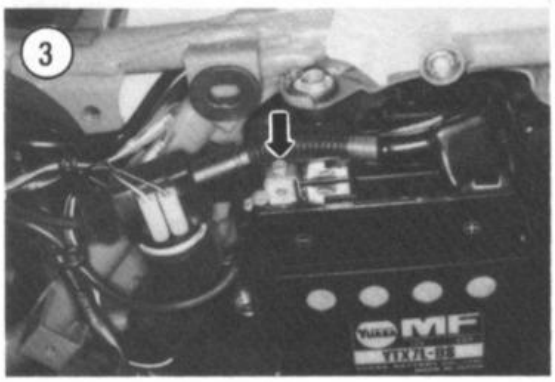
a. Cylinder head cover and rocker arms.
b. Cylinder head, camshaft and cylinder block.
c. Piston rings and piston.
d. External gearshift mechanism.
e. Clutch.
f. Kickstarter (models so equipped).
g. Oil pump.
h. Carburetor assembly.
i. Alternator assembly and electrical systems.

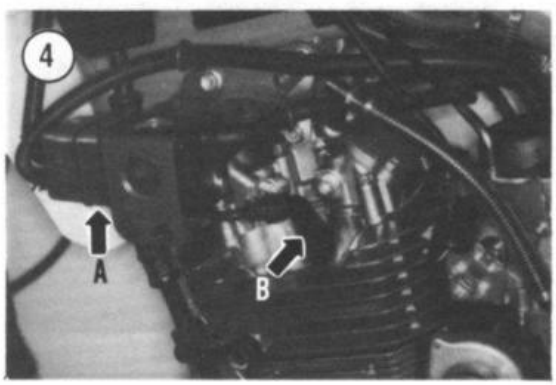
These components are covered in this chapter and other related chapters in this book.

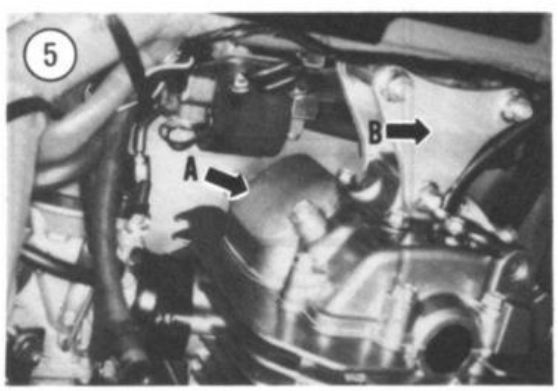
1

FOUR-STROKE OPERATING PRINCIPLES


Carburetor
Intake valve
Air
Air/fuel
Cylinder
1
INTAKE
Intake valve opens as piston begins downward, drawing air/fuel mixture into the cylinder, through the valve.
2
COMPRESSION
Intake valve closes and piston rises in cylinder, compressing air/fuel mixture.
Exhaust valve
Exhaust
4
EXHAUST
Exhaust valve opens as piston rises in cylinder, pushing spent gases out through the valve.
3
POWER
Spark plug ignites compressed mixture, driving piston downward. Force is applied to crankshaft causing it to rotate.







If the entire engine is going to be removed, refer to *Engine Removal/Installation* in Chapter Five.

CYLINDER HEAD COVER AND ROCKER ARMS

The cylinder head cover and rocker arms can be removed with the engine in the frame. Part of this procedure is shown with the engine removed for clarity.

4

Cylinder Head Cover Removal/Installation

1. Drain the engine oil as described in Chapter Three.
2. Support the bike on a stand and raise the rear wheel off the ground with a suitable wheel stand.
3. Remove the left- and right-hand side covers (A, **Figure 2**).
4. Remove the seat (B, **Figure 2**) as described in Chapter Thirteen.
5. Disconnect the battery negative (–) electrical terminal connector (**Figure 3**).
6. Remove the fuel tank as described in Chapter Eight.
7. Remove the exhaust pipe as described in Chapter Eight.
8. Remove the carburetor as described in Chapter Eight.
9. On California models, remove the evaporation emission control assembly (A, **Figure 4**) as described in Chapter Eight.
10. Remove the spark plug (B, **Figure 4**) as described in Chapter Three. This will make it easier to rotate the engine by hand.
11. Remove the exhaust and intake valve adjuster covers (A, **Figure 5**) from the cylinder head cover.
12. Place a drip pan under the left-hand crankcase cover as some oil may drain out when the timing hole covers are removed in the next step.
13. Remove the 2 covers (**Figure 6**) from the timing holes on the left-hand crankcase cover.

NOTE

A cylinder at top dead center (TDC) of its compression stroke will have free play in all of its rocker arms, indicating that all the intake and exhaust valves are closed.

14. Use a 27 mm socket and wrench (**Figure 7**) on the alternator mounting nut (**Figure 8**), rotate the rotor *counterclockwise* until the cylinder is at top dead center (TDC) on the compression stroke. To determine TDC for the cylinder, perform the following:
    a. Align the "T" mark on the rotor with the crankcase timing mark (**Figure 9**).
    b. Wiggle both rocker arms. There should be free play in both rocker arms, indicating that both the intake and exhaust valve sets are closed.
    c. If either the intake or exhaust rocker arms *do not* have free play, rotate the rotor *counterclockwise* an additional 360° and again align the "T" mark on the rotor with the crankcase timing mark (**Figure 9**).
    d. Again wiggle both rocker arms. There should be free play in all rocker arms, indicating that both sets of intake and exhaust valves are closed. The cylinder is now at top dead center (TDC) on the compression stroke.
15. Remove the bolts and nuts securing the engine upper mount brackets (B, **Figure 5**) and remove the brackets.
16. On models so equipped, disconnect the decompression cable from the lever.

NOTE

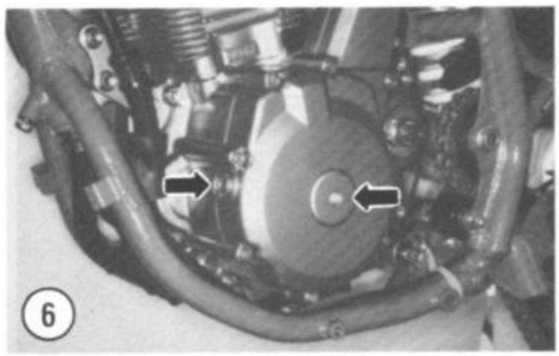
The following procedures are shown with the engine removed for clarity.

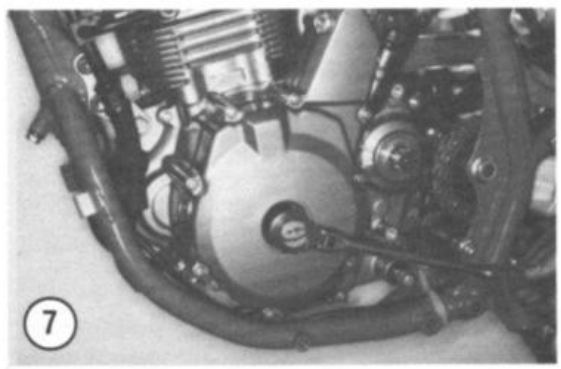
17. Using a crisscross pattern, loosen the bolts securing the cylinder head cover (A, **Figure 10**) in 2-3 stages. Remove all bolts. Don't lose the washer under the 4 center bolts (B, **Figure 10**).
18. Lift the cylinder head cover up and remove it. Don't lose the locating dowels.
19. Inspect the cylinder head cover and rocker arms as described in this chapter.
20. Install by reversing these removal steps while noting the following:
    a. Make sure the engine is still at TDC on the compression stroke.

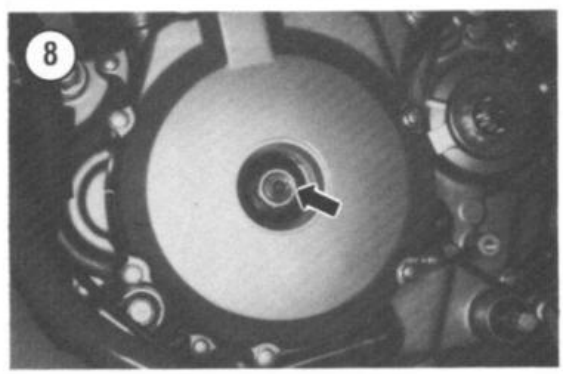
NOTE

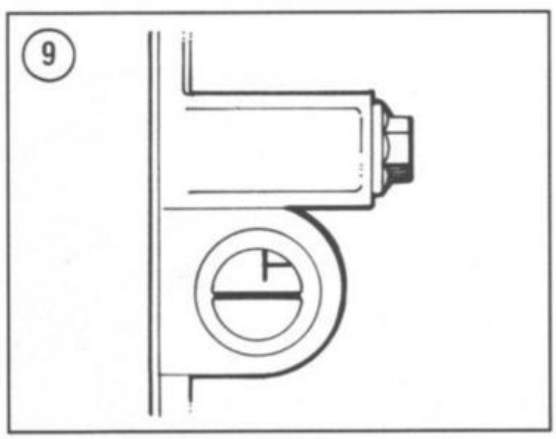
Make sure both cylinder head cover and cylinder head mating surfaces are clean and free of all old gasket material. This is to make sure you get a leak free seal.

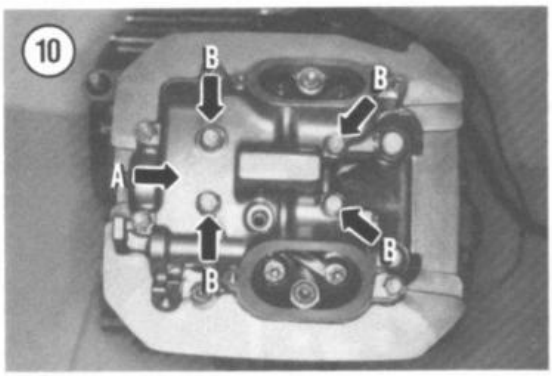
    b. Apply a light coat of a gray *non-hardening liquid gasket* such as Three Bond, or equiva-

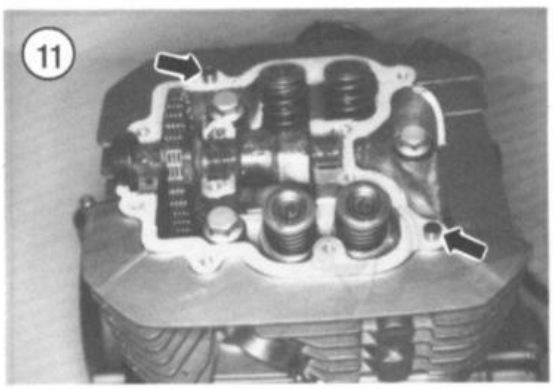


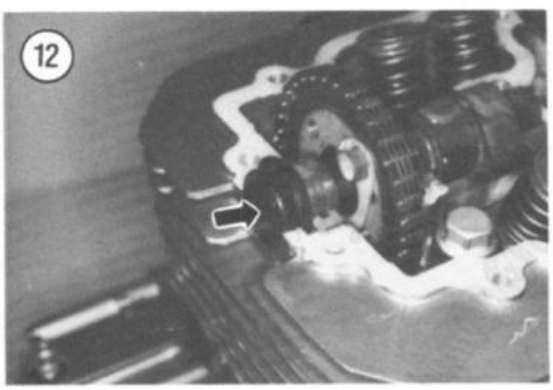


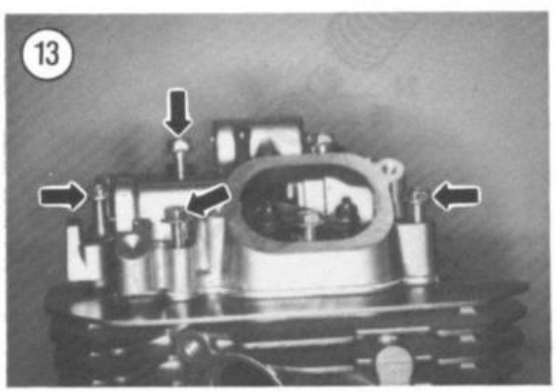










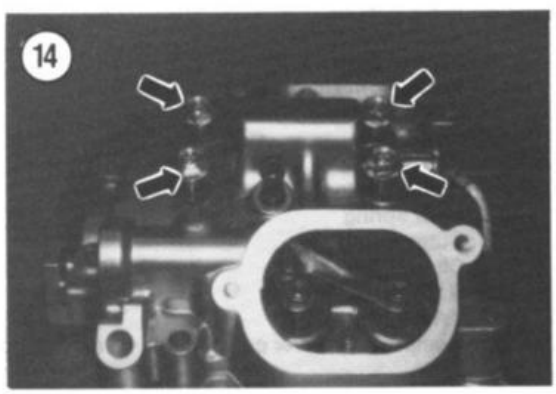


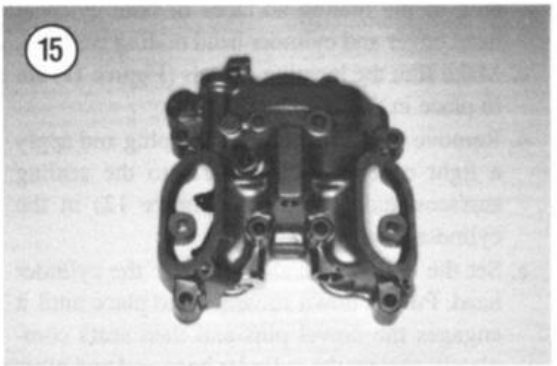
lent, to the mating surfaces of both cylinder head cover and cylinder head mating surfaces.

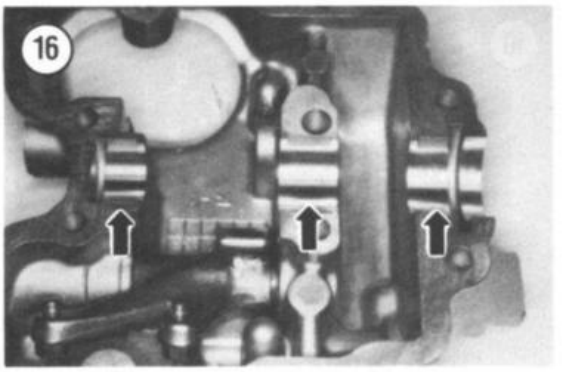
c. Make sure the locating dowels (**Figure 11**) are in place in the cylinder head.
d. Remove the camshaft bore end plug and apply a light coat of gasket sealer to the sealing surfaces and reinstall it (**Figure 12**) in the cylinder head.
e. Set the cylinder head cover onto the cylinder head. Push it down squarely into place until it engages the dowel pins and then seats completely against the cylinder head and end plug.
f. Install all bolts into the cylinder head cover holes and push them down onto the cylinder head threaded holes, don't thread them in at this time. Make sure they all stick out the same distance from the cover surface (**Figure 13**). If some are farther in or out than the rest they are in the wrong location. Reposition at this time until all are even.
g. Be sure to install the washer under the 4 center bolts (**Figure 14**).
h. Tighten the cylinder head cover bolts in a crisscross pattern and to the torque specification in **Table 3**.

Cylinder Head Cover Inspection

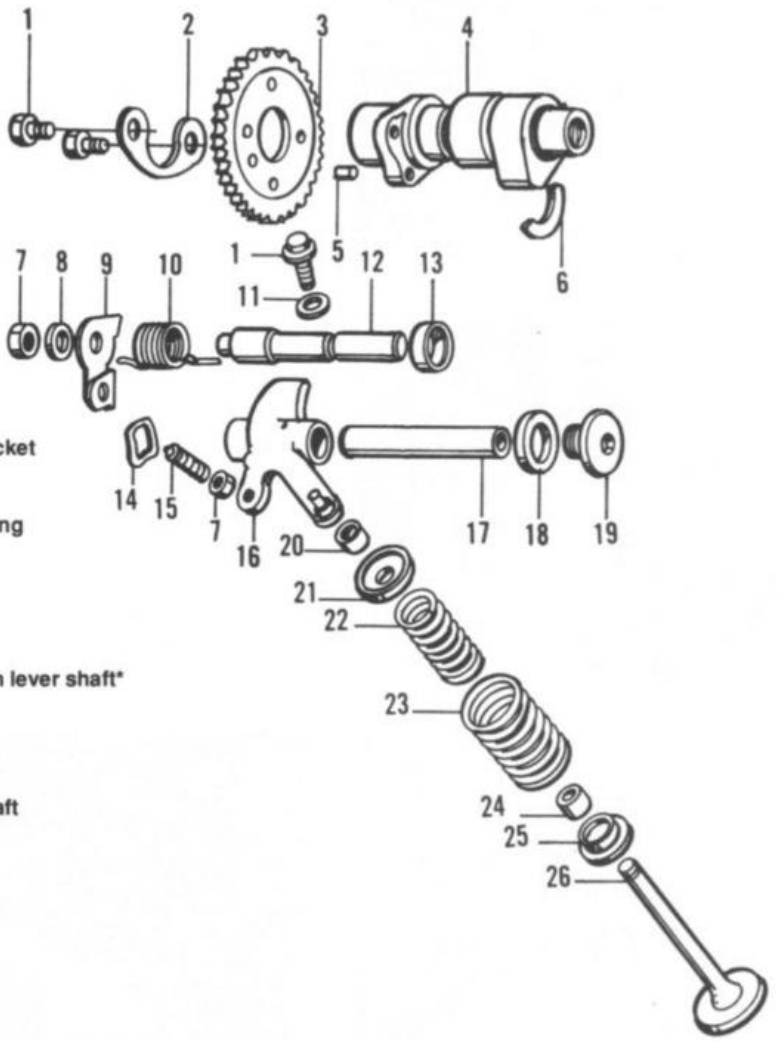
1. Inspect the cylinder head cover for cracks or damage (**Figure 15**). Replace if necessary.
2. Inspect the cylinder head cover mounting bracket bosses for cracks or damage. If any cracks are visible, replace the cylinder head cover since it helps to stabilize the upper end of the engine in the frame.
3. Inspect the camshaft bearing surface (**Figure 16**) in the cylinder head cover for wear or scoring. If





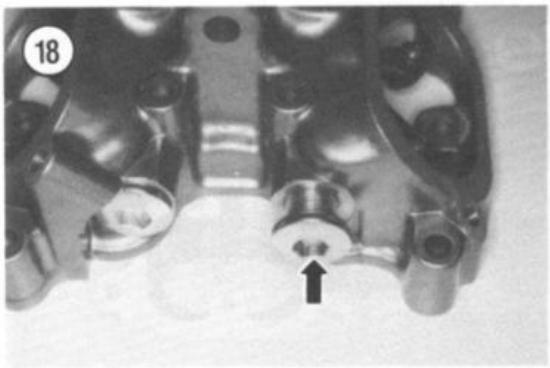


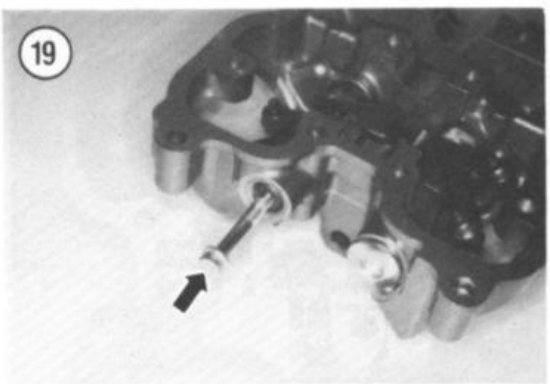
17 CAMSHAFT, ROCKER ARMS AND VALVE ASSEMBLY

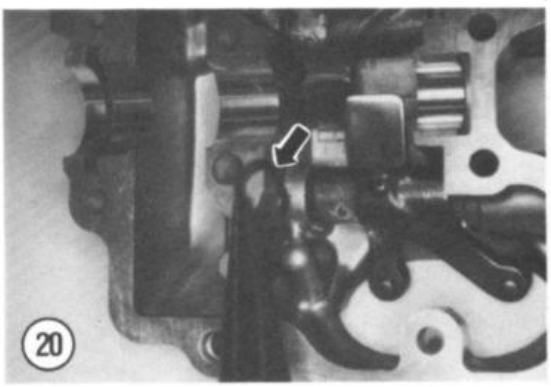


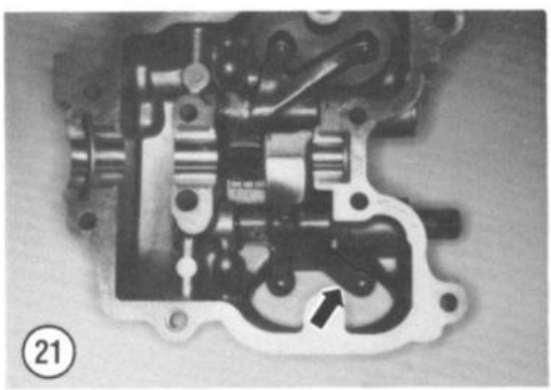
1. Bolt
2. Lockplate
3. Camshaft sprocket
4. Camshaft
5. Pin
6. Camshaft set ring
7. Nut*
8. Washer*
9. Lever*
10. Washer*
11. Washer*
12. Decompression lever shaft*
13. Oil seal*
14. Wave washer
15. Adjust screw
16. Rocker arm
17. Rocker arm shaft
18. Gasket
19. Shaft plug
20. Cotters
21. Spring retainer
22. Inner spring
23. Outer spring
24. Oil seal
25. Spring seat
26. Valve

*Decompression lever components on models so equipped.









worn or damaged, inspect the bearing surface in the cylinder head and the camshaft as described in this chapter. If the bearing surface in the cylinder head cover or cylinder head are worn or damaged, both parts must be replaced as a set, they cannot be purchased separately.

4. On models so equipped, check the decompression lever oil seal for wear, damage or signs of oil leakage. Replace the seal as follows:
   a. Carefully pry the oil seal out of the cylinder head cover with a straight tipped screwdriver. Place a rag underneath the screwdriver to avoid damaging the cylinder head cover.
   b. Clean the oil seal mounting area with solvent and dry thoroughly. Check the mounting area for cracks or other damage before installing the new seal.
   c. Tap the new seal into position with a suitable size socket placed on the outside of the seal. Tap the seal until it is flush with the bore surface.
5. On models so equipped, check the decompression lever for excessive wear or damage.

Rocker Arm
Disassembly/Assembly

Refer to **Figure 17** for this procedure.

Keep the rocker arm assemblies separated in their respective sets. Do not intermix the parts as they have taken on their own unique wear pattern. The rocker arm shafts are not identical and have to be installed in the correct location in the cylinder head cover.

1. On models so equipped, remove the cover bolt securing the decompression lever cable mounting bracket and remove the bracket.
2. Remove the rocker shaft plug and gasket (**Figure 18**).
3. Screw a 6 mm bolt (**Figure 19**) into the threaded hole in the end of the intake rocker arm shaft.
4. Partially withdraw the intake rocker arm shaft and remove the wave washer (**Figure 20**) and unscrew the 6 mm bolt from the rocker arm shaft.
5. Continue to withdraw the intake rocker arm shaft and remove the rocker arm (**Figure 21**).
6. Completely remove the rocker arm shaft (**Figure 22**).
7. Repeat Steps 2-6 for the exhaust rocker arm (A, **Figure 23**) and wave washer (B, **Figure 23**).

8. Install the rocker arms and shaft into the cylinder head by reversing these steps while noting the following:

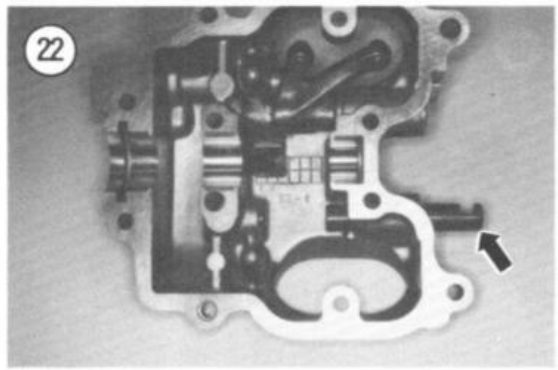
a. The rocker arms are not symmetrical and must be installed in the correct location in the cylinder head cover. The exhaust rocker arm pad (C, **Figure 23**) is close to the camshaft sprocket side of the cylinder head cover. The intake rocker arm pad (A, **Figure 24**) is close to the side of the cylinder head cover where the rocker arm shaft plugs are located. They must be installed as shown so the rocker arm pads will align properly with the camshaft lobes.

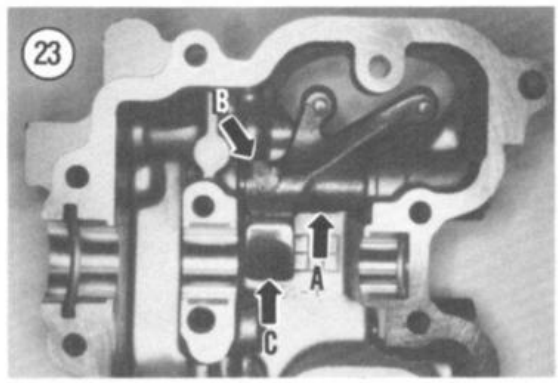
b. Be sure to install the wave washers in their correct location as noted during removal.

c. Position the rocker arm shafts with the threaded end going in last.

d. Prior to pushing the intake rocker arm shaft all the way in, align the relief (B, **Figure 24**) in the shaft with the bolt hole (C, **Figure 24**) in the cylinder head cover.

e. Make sure the gasket (**Figure 25**) is in place on the rocker arm shaft plug prior to installation.





Decompression Lever Shaft Removal/Installation (Models So Equipped)

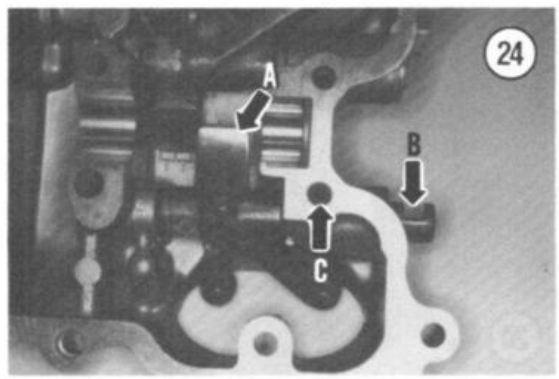
1. Remove the bolt and washer securing the shaft in place.

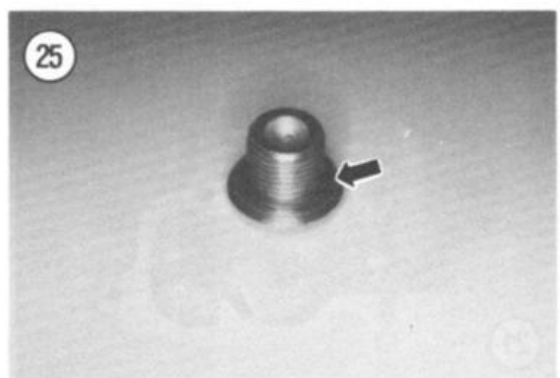
2. Withdraw the decompression lever shaft assembly from the cylinder head cover. Don't lose the spring on the end of the shaft.

3. Install the decompression lever shaft into the cylinder head cover and push it in until it stops.

4. Insert the spring end into the hole in the cylinder head cover and correctly position the other end on the lever.

5. Make sure the shaft groove is aligned with the bolt hole in the cover and install the bolt and washer. Tighten the bolt securely.

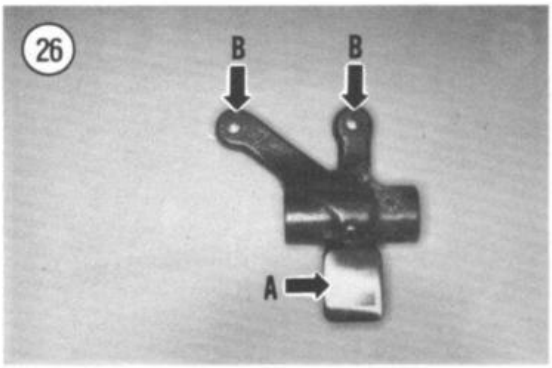


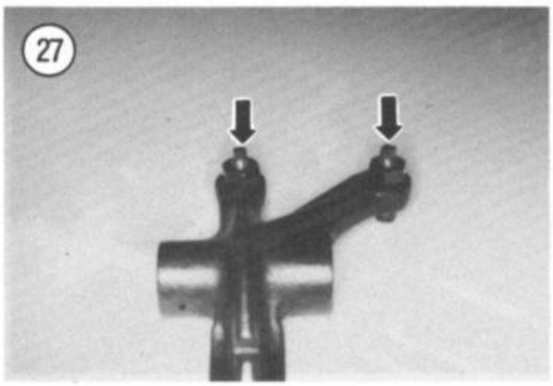


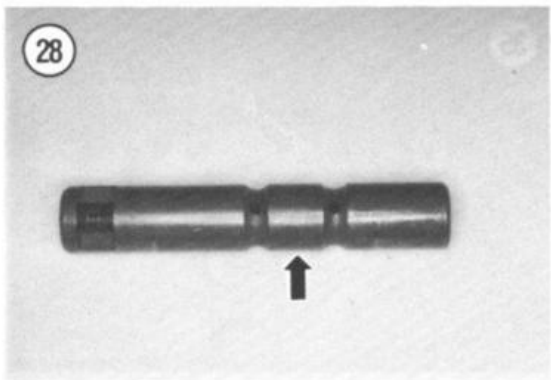
Rocker Arm Inspection

Do not intermix the parts as they have taken on their own unique wear pattern.

1. Clean all parts of one set in solvent and thoroughly dry with compressed air.







2. Inspect the rocker arm bore for signs of wear or scoring.

3. Inspect the rocker arm for cracks or damage.

4. Check the rocker arm pad (A, **Figure 26**) where it rides on the camshaft and where it rides on the valve stem (B, **Figure 26**). Each place must be smooth with no gouges or wear points. Replace the rocker arm if necessary.

5. Check the rocker arm adjust screw and locknut (**Figure 27**) for wear or damage. Replace the adjust screw and locknut if necessary.

6. Inspect the rocker arm shaft where the rocker arms ride (**Figure 28**) for signs of wear or scoring.

NOTE

If either the rocker arm or shaft are out of specification, replace the rocker arm and the rocker arm shaft as a set.

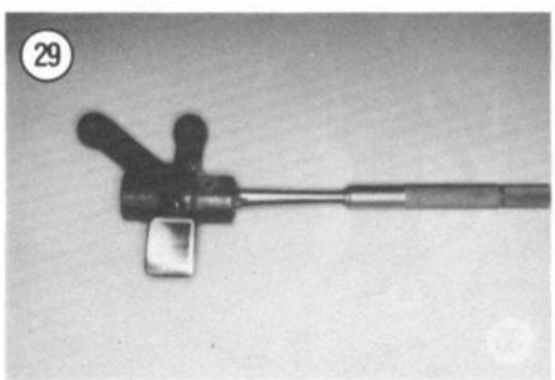
7. Measure the inside diameter of the rocker arm bore with a small snap hole gauge (**Figure 29**). Then measure the gauge with a micrometer (**Figure 30**) to determine the rocker arm bore inside diameter. Compare to the dimension listed in **Table 2**.

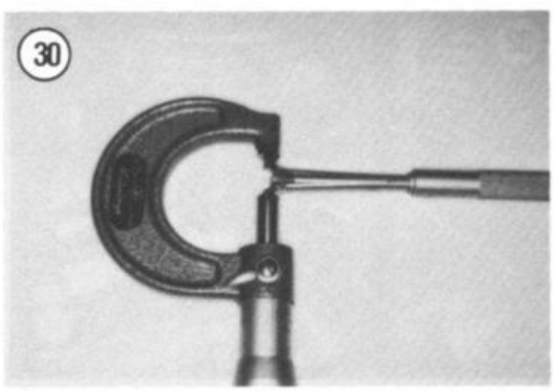
8. Measure the outside diameter of the rocker arm shaft (**Figure 31**) with a micrometer. Compare to the dimension listed in **Table 2**.

9. Roll the rocker arm shafts on a flat surface like a piece of plate glass. Check for signs of bending or damage. Replace the rocker arm shafts if any bending is evident.

CAMSHAFT AND TENSIONER

This section describes removal, inspection and installation procedures for the camshaft components. Refer to **Figure 17** for this procedure.



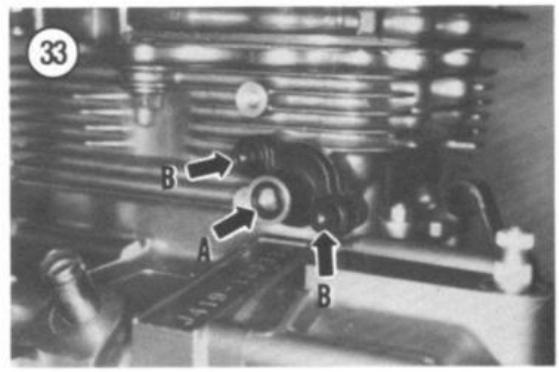


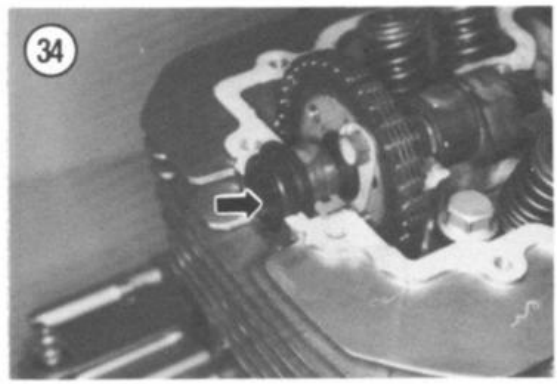
NOTE

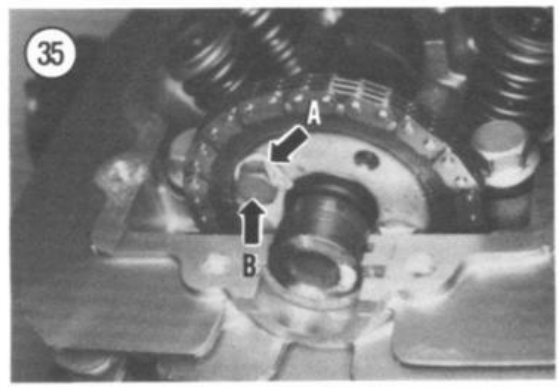
This procedure is shown with the engine removed for clarity.

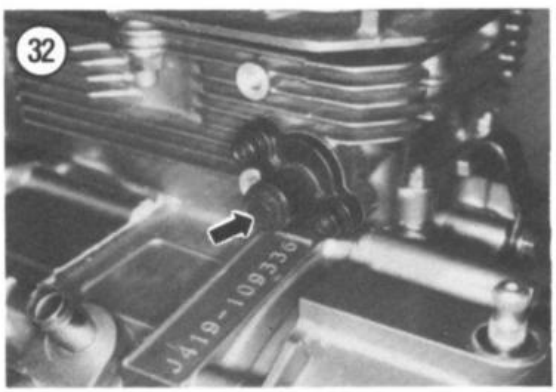
Camshaft Removal

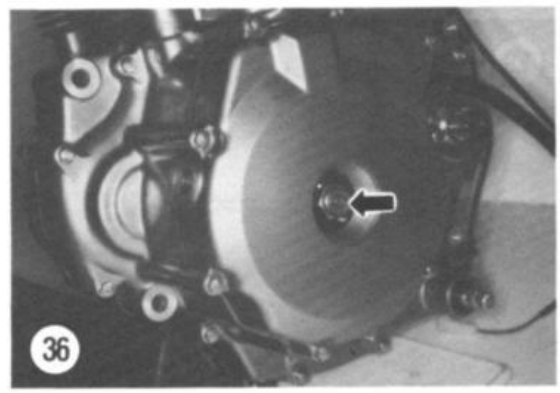
1. Remove the cylinder head cover and rocker arm assembly as described in this chapter.
2. Remove the center bolt (A, **Figure 32**) and gasket (A, **Figure 33**) from the camshaft drive chain tensioner assembly.
3. Remove the bolts (B, **Figure 33**) securing the camshaft drive chain tensioner assembly and remove the assembly and gasket. This will relieve the tension on the camshaft drive chain to allow slack in the chain.
4. Remove the camshaft bore end plug (**Figure 34**) from the cylinder head.
5. Straighten the tab (A, **Figure 35**) on the lockplate and remove the exposed bolt (B, **Figure 35**) securing the driven sprocket to the camshaft.
6. Using a 27 mm socket and wrench on the alternator rotor nut (**Figure 36**), rotate the engine *counterclockwise* until the other sprocket bolt is visible.

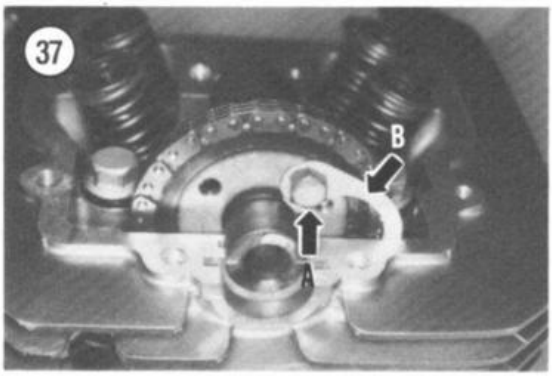


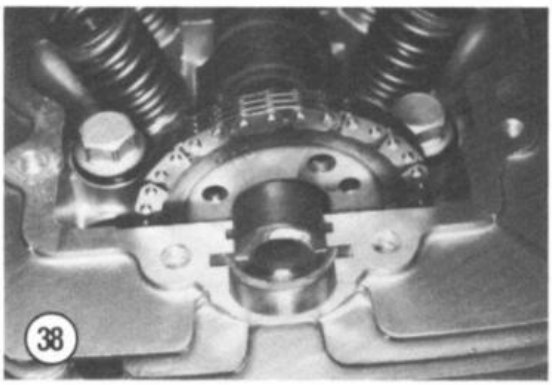


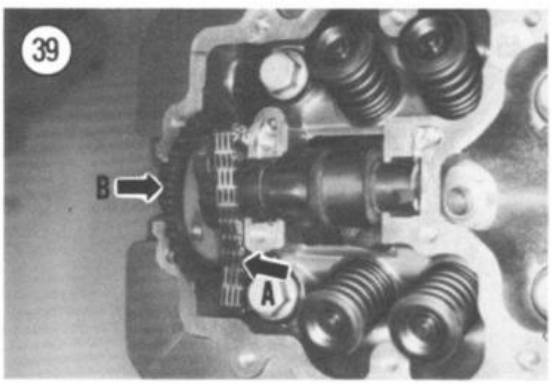


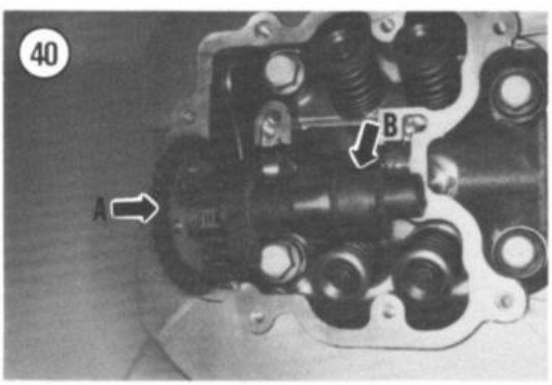












NOTE

Hold onto the lockplate while removing the last bolt. If the lockplate falls down the chain cavity it may end up in the crankcase requiring complete engine disassembly to retrieve it.

7. Straighten the tab on the lockplate and remove the other bolt (A, **Figure 37**) and lockplate (B, **Figure 37**) securing the driven sprocket to the camshaft. Discard the lockplate as a new one must be installed during the installation procedure.
8. Slide the camshaft driven sprocket and chain off the camshaft shoulder (**Figure 38**).
9. Disengage the camshaft chain (A, **Figure 39**) from the camshaft driven sprocket (B, **Figure 39**).
10. Pull up on the camshaft and chain and remove the driven sprocket (A, **Figure 40**).

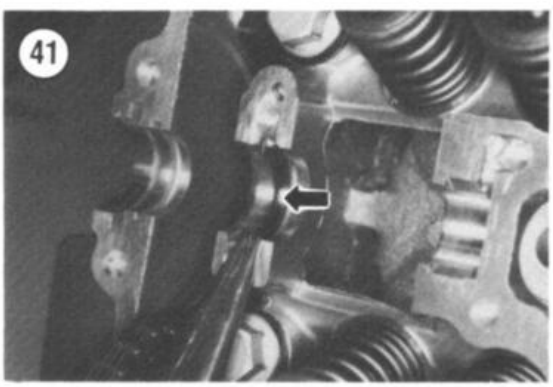
NOTE

Make sure the small pin in the camshaft sprocket mounting flange doesn't fall out during camshaft removal.

11. Hold onto the chain and carefully remove the camshaft (B, **Figure 40**) slowly to prevent damaging any camshaft lobe or bearing surface in the cylinder head.
12. Tie a piece of wire to the camshaft drive chain and tie the other end to the exterior of the engine. This will prevent the chain from falling down into the crankcase.
13. Remove the camshaft set ring (**Figure 41**) from the cylinder head.

CAUTION

The crankshaft can be turned with the camshaft removed. However, pull the camshaft chain up tight and make sure



it is properly meshed with the drive sprocket on the crankshaft. This will prevent the chain from bunching up on the crankshaft sprocket and damaging the crankshaft and crankcase.

Camshaft Inspection

1. Check cam lobes (A, **Figure 42**) for wear. The lobes should not be scored and the edges should be square.

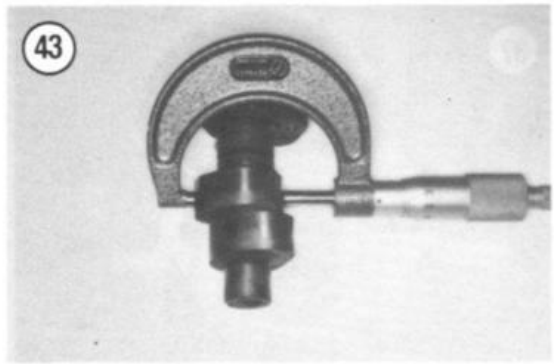
2. Even though the cam lobe surface appears to be satisfactory, with no visible signs of wear, each lobe must be measured with a micrometer. Measure the lobe height (**Figure 43**) and replace the camshaft if worn to or beyond the service specifications listed in **Table 2**.

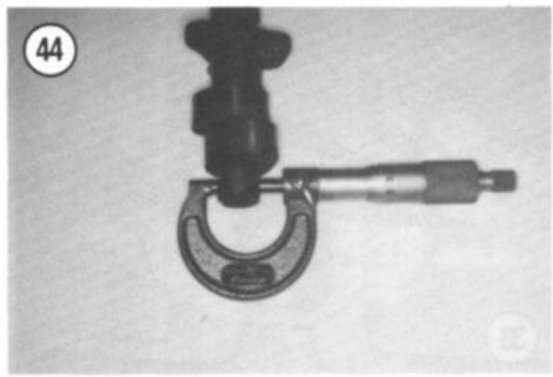
3. Check the camshaft bearing journals (B, **Figure 42**) for wear and scoring.

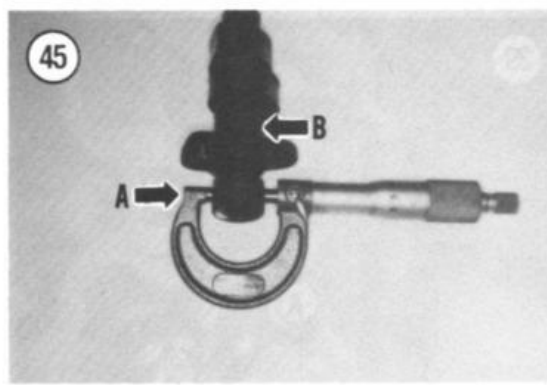
4. Even though the camshaft bearing journal surface appears satisfactory, with no visible signs of wear, the camshaft bearing journals outside diameter must be measured with a micrometer. Measure the left-hand end (**Figure 44**) and the right-hand end (A, **Figure 45**) and center (B, **Figure 45**) bearing journal. Replace the shaft if worn to or beyond the service specifications listed in **Table 2**.

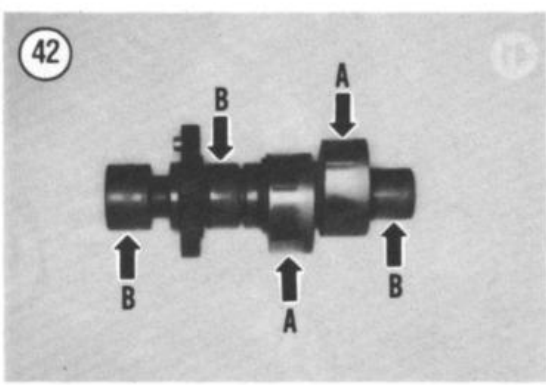
5. Place the camshaft on a set of V-blocks and check its runout with a dial indicator at the bearing surface locations. Replace the camshaft if runout exceeds the service limit in **Table 2**.

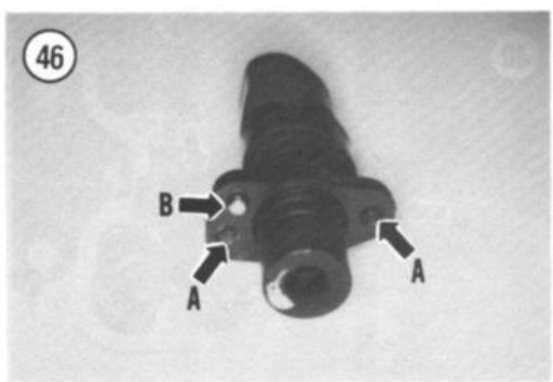
6. Inspect the sprocket bolt hole threads (A, **Figure 46**) for wear or damage. If necessary, clean out with an appropriate size thread tap. Also make sure the sprocket locating pin (B, **Figure 46**) is tight in the mounting flange.

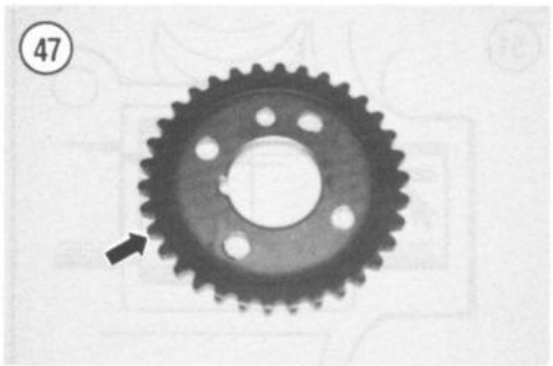


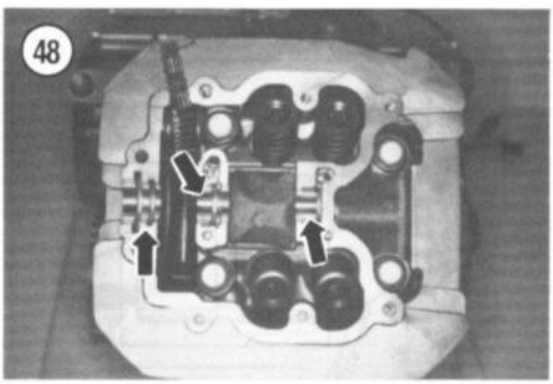


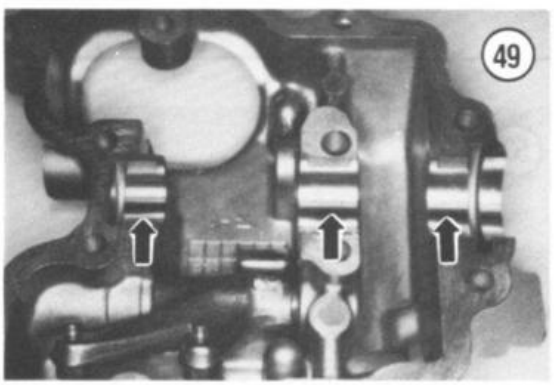


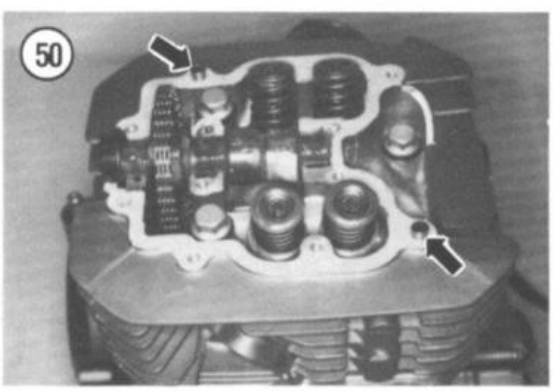












7. Inspect the camshaft driven sprocket. Check the driven sprocket for worn or damaged gear teeth (**Figure 47**). Also check the teeth for cracking or rounding, replace if necessary.

NOTE

If the camshaft driven sprocket is worn, also check the camshaft chain, the drive sprocket on the crankshaft, chain guide and chain tensioner as described in this chapter and in Chapter Five.

8. Check the camshaft bearing journals in the cylinder head (**Figure 48**) and cylinder head cover (**Figure 49**) for wear and scoring. They should not be scored or excessively worn. If the bearing surface in the cylinder head cover or cylinder head are worn or damaged, both parts must be replaced as a set, they cannot be purchased separately.

Camshaft Bearing Clearance Measurement

1. Keep the wire attached to the camshaft drive chain and let the chain move down into the chain cavity. Carefully drape the wire out through the plug hole in the right-hand side of the cylinder head.
2. Wipe all oil residue from each camshaft bearing surface in the cylinder head and cylinder head cover and the camshaft.
3. Make sure the locating dowels (**Figure 50**) are installed in the cylinder head.
4. Install the camshaft into the cylinder head *without* the sprocket. Make sure the camshaft drive chain wire is still in the plug hole cavity and not interfering with the sealing surfaces of both parts.
5. Place a strip of Plastigage material on top of the camshaft 3 bearing journals (**Figure 51**), parallel to the camshaft.
6. Install the cylinder head cover and bolts. Tighten the bolts in a crisscross pattern to the torque specification listed in **Table 3**.

CAUTION

Do not rotate the camshaft with the Plastigage material in place.

7. Loosen the cylinder head cover bolts in 2-3 stages in a crisscross pattern.
8. Pull the cylinder head cover straight up and off the camshaft and cylinder head.

9. Measure the width of the flattened Plastigage material (**Figure 52**) at the widest point, according to manufacturer's instructions. This dimension will give the oil clearance between the 2 parts. Compare to the dimension listed in **Table 2**.

10. If the clearance exceeds the wear limit in **Table 2**, determine which parts must be replaced. If the camshaft bearing journal is less than specified, replace the camshaft. If the camshaft is within specifications, the cylinder head cover and cylinder head must be replaced as a matched set.

CAUTION

Be sure to remove all traces of Plastigage material from the camshaft and cylinder head cover. If any material is left in the engine it can plug an oil control orifice and cause severe engine damage.

11. Remove *all* Plastigage material from the camshaft and cylinder head cover.

Camshaft Chain Tensioner Inspection

The camshaft chain tensioner automatically takes up the tension on the drive chain. There are no provisions for any form of adjustment.

If any part of the tensioner is damaged, replace the entire assembly as replacement parts are not available.

Inspect the bolt, washer and spring (A, **Figure 53**) for wear or damage. Check the tensioner body (B, **Figure 53**) for cracks, wear or damage.

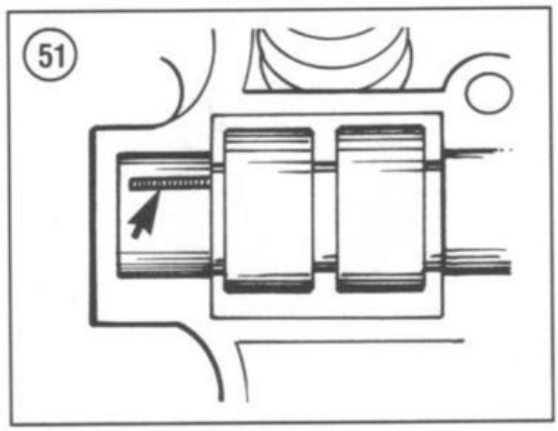
Camshaft Installation

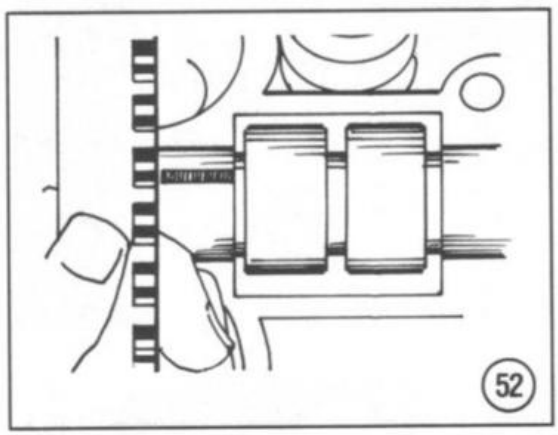
1. Install the camshaft set ring (**Figure 41**) into the cylinder head.

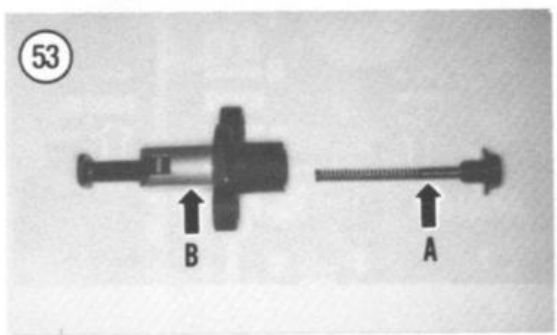
2. Coat all camshaft lobes and bearing journals and the camshaft bearing surfaces in the cylinder head cover and cylinder head (**Figure 54**) with molybdenum disulfide grease or assembly oil.

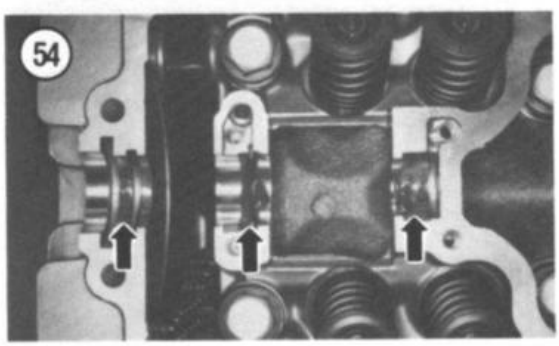
3. Using a 27 mm socket and wrench on the alternator rotor nut (**Figure 36**), rotate the engine *counterclockwise* until the "T" timing mark on the alternator rotor aligns with the timing mark pointer on the crankcase. Refer to **Figure 55** if the alternator cover is in place or to **Figure 56** if the cover is removed.

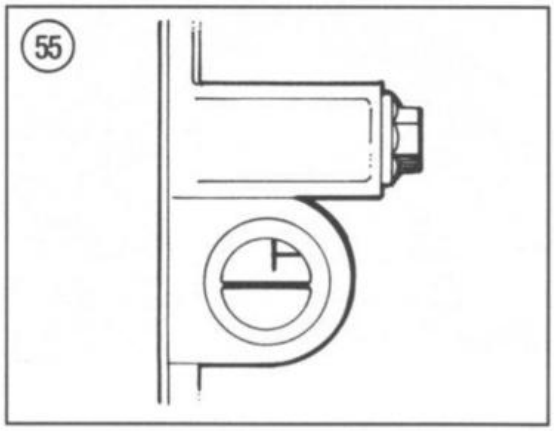
4. Position the camshaft with the lobes facing down and carefully install the camshaft (B, **Figure 40**)

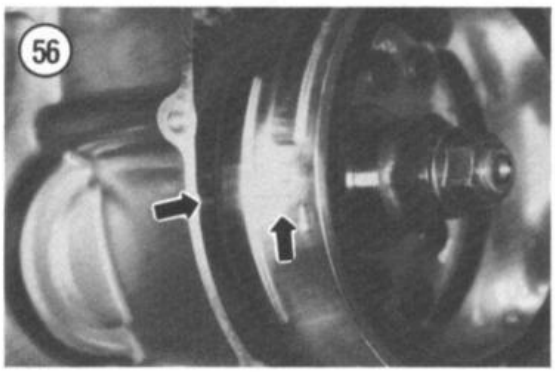


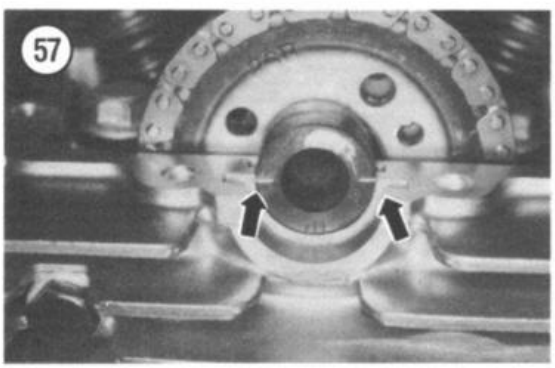


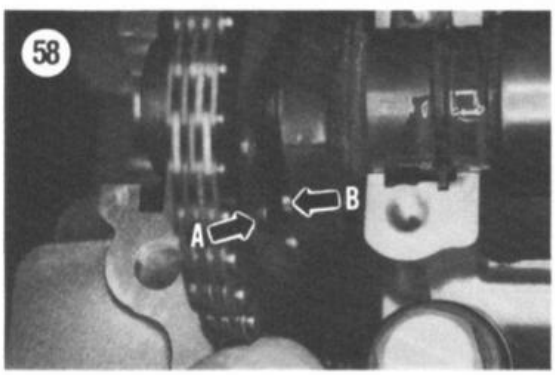












slowly to prevent damage to either camshaft lobe or bearing surface in the cylinder head.

5. Loop the camshaft drive chain over the end of the camshaft and install the driven sprocket (A, **Figure 40**) onto the end of the camshaft.

6. Set the camshaft in the bearing surfaces in the cylinder head with the camshaft lobes facing down. Make sure the camshaft groove is positioned correctly into the set ring installed in Step 2.

7. Slightly rotate the camshaft in either direction to align the camshaft index marks (**Figure 57**) with the top surface of the cylinder head.

8. Rotate the camshaft driven sprocket until the mounting bolt holes align with the camshaft, then engage the camshaft chain (A, **Figure 39**) onto the camshaft driven sprocket (B, **Figure 39**). Rest the driven sprocket on the camshaft shoulder (**Figure 38**).

NOTE

Make sure the small pin in the camshaft sprocket mounting flange doesn't fall out during sprocket installation.

9. Align the locating hole in the driven sprocket (A, **Figure 58**) with the small pin on the camshaft mounting flange (B, **Figure 58**) and push the driven sprocket onto the camshaft mounting sprocket.

10. Check that the index marks on the camshaft are still aligned with the top surface of the cylinder head (**Figure 57**).

CAUTION

Very expensive damage could result from improper camshaft and chain alignment. Make sure alignment is correct. If alignment is incorrect, it must be corrected at this time.

11. Insert your finger into the tensioner hole in the cylinder and push on the drive chain until all slack is removed from the drive chain. At this point the following timing marks must align:

a. The index marks on the camshaft (**Figure 59**) must be aligned with the top surface of the cylinder head.

b. The timing mark on the alternator rotor must align with the timing mark pointer on the crankcase. Refer to **Figure 55** if the alternator cover is in place or to **Figure 56** if the cover is removed.

12. If any of the timing marks are not aligned, realign them at this time.

CAUTION

The camshaft driven sprocket bolts are made of a hardened material. When replacing these bolts, use only Suzuki replacement bolts specified for this application. Do not substitute with another type of bolt as severe engine damage could result from improper bolt usage resulting in bolt breakage.

13. Install a *new* lockplate (B, **Figure 37**) and the bolt (A, **Figure 37**) into the exposed bolt hole to secure the sprocket to the camshaft. Tighten the bolt to a good finger-tight at this time.

CAUTION

If there is any binding while turning the crankshaft in Step 15, "stop." Recheck the camshaft timing marks. Improper timing can cause valve and piston damage.

14. Using a 27 mm socket and wrench on the alternator rotor nut (**Figure 60**), rotate the engine *counterclockwise* until the other sprocket driven bolt hole is visible.

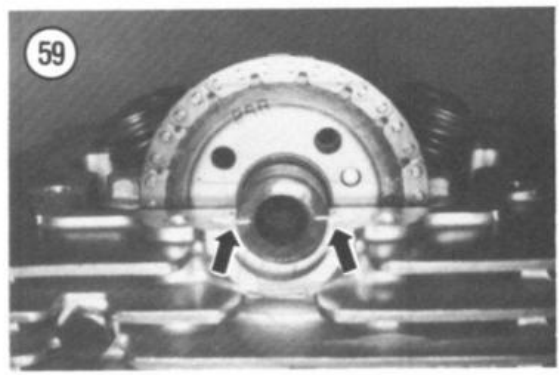
15. Apply red Loctite (No. 271) to the remaining driven sprocket bolt, then install this bolt securing the driven sprocket to the camshaft. Tighten the bolt to the torque specification listed in **Table 3** and bend down the tab on the lockplate against the flat on the bolt head.

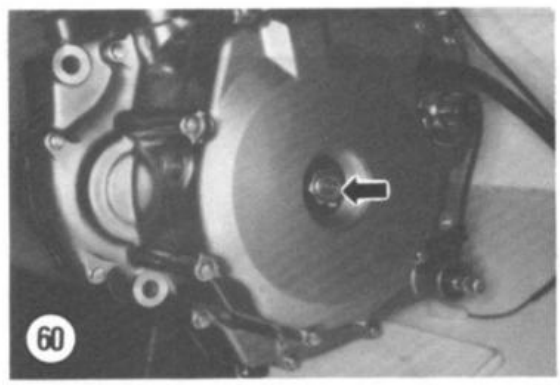
16. Again, rotate the engine *counterclockwise* until the other sprocket bolt installed in Step 14 is visible. Remove the bolt.

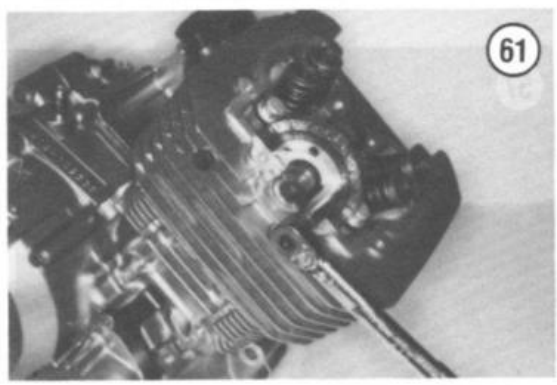
17. Apply red Loctite (No. 271) to the sprocket bolt, then install the bolt and tighten (**Figure 61**) to the torque specification listed in **Table 3** and bend down the tab on the lockplate against the flat on the bolt head.

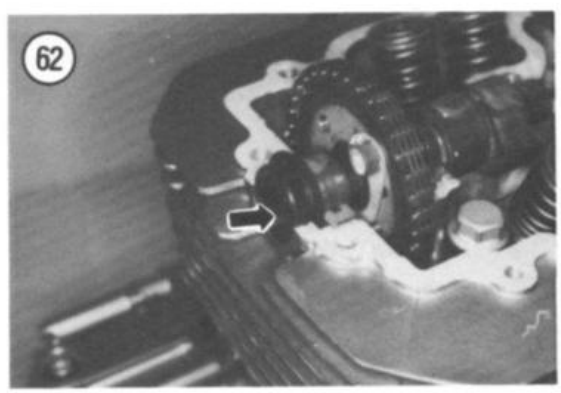
18. Apply a light coat of gasket sealer to the camshaft bore end plug and install the plug (**Figure 62**) into the cylinder head. Make sure it is seated correctly in the cylinder head groove.

19. On the camshaft drive chain tensioner body, push down on the ratchet mechanism with your finger, then push the plunger (**Figure 63**) all the way into the tensioner body.





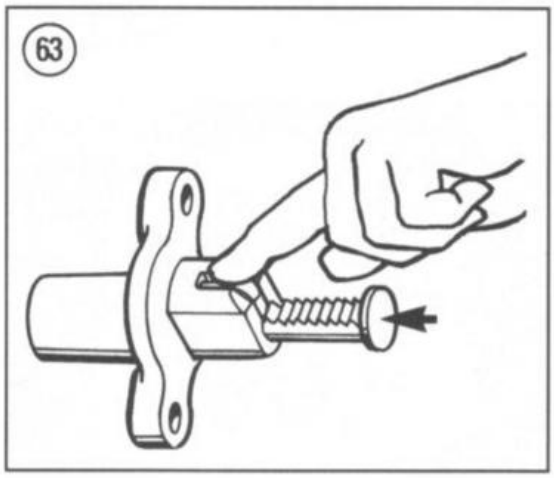


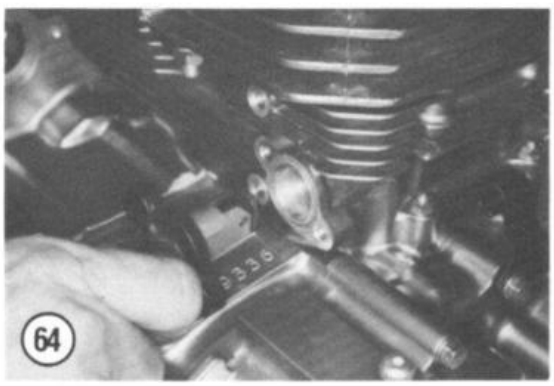


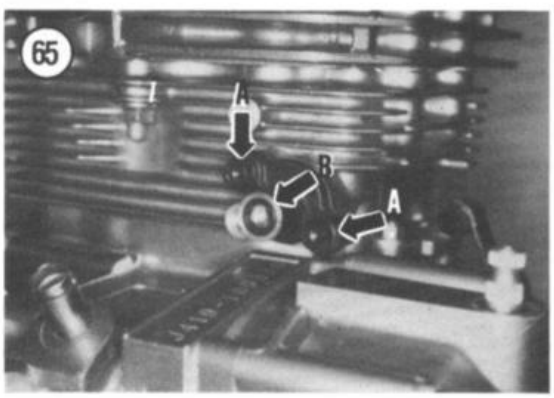
20. Install the camshaft drive chain tensioner assembly and gasket (**Figure 64**) into the cylinder and install the bolts (A, **Figure 65**). Tighten the bolts to the torque specification listed in **Table 2**.

21. Install a new O-ring gasket (B, **Figure 65**) and coat it with clean engine oil.

22. Install the center bolt (**Figure 66**) and tighten to the torque specification listed in **Table 2**.







23. Install the cylinder head cover and rocker arm assembly as described in this chapter.

24. Adjust the valve clearance as described in Chapter Three.

25. On models so equipped, adjust the decompression lever as described in Chapter Three.

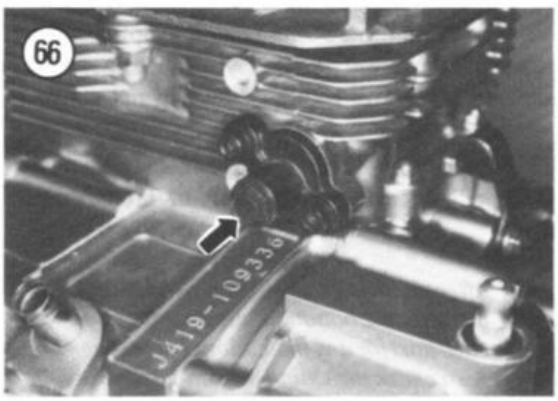
CYLINDER HEAD

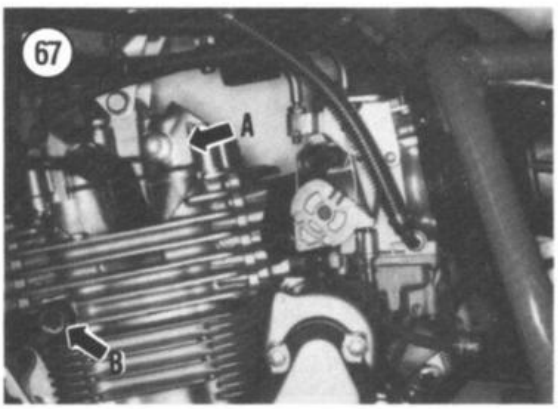
Removal

1. Remove the cylinder head cover (A, **Figure 67**) and camshaft as described in this chapter.

2. Remove the union bolt and sealing washers (B, **Figure 67**) securing the external oil hose to the cylinder head. Move the hose out of the way. Place the union bolt and sealing washers in a reclosable plastic bag to avoid misplacing them.

NOTE
The remainder of this procedure is shown with the engine removed for clarity.





3. Remove the bolt and washer (**Figure 68**) securing the upper end of the camshaft chain tensioner to the cylinder. Remove the tensioner (**Figure 69**) from the cylinder.

4. Using a crisscross pattern, loosen in 2-3 stages the bolts (**Figure 70**) securing the cylinder head to the cylinder.

5. Remove the front cylinder head-to-cylinder nut and washer (**Figure 71**).

6. Remove the rear cylinder head-to-cylinder nut and washer (**Figure 72**).

7. Loosen the cylinder head by tapping around the perimeter with a soft-faced rubber or plastic mallet.

8. Untie the wire securing the camshaft drive chain to the exterior of the engine.

9. Lift the cylinder head (**Figure 73**) up and off of the cylinder and feed the wire through the chain cavity in the cylinder.

10. Place the cylinder head on a soft surface upside down to prevent scratching or otherwise damaging the cylinder head-to-cylinder block mating surface. Remove and discard the cylinder head gasket.

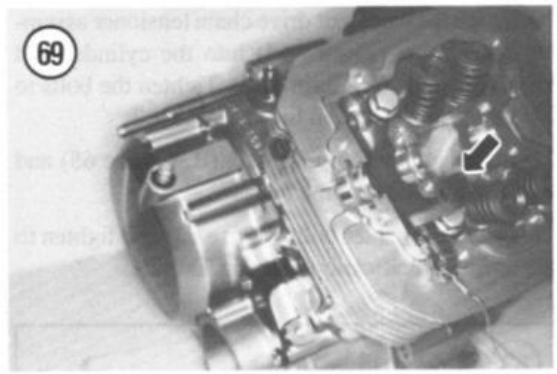
11. Retie the camshaft drive chain wire to the exterior of the crankcase.

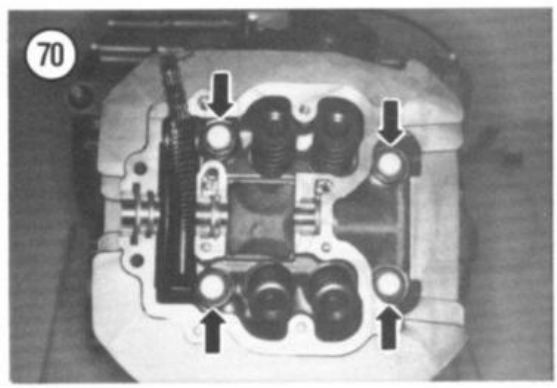
12. Don't lose the 2 dowel pins. It is not necessary to remove the dowel pins if they are not loose; if they are loose, remove them so they will not get misplaced.

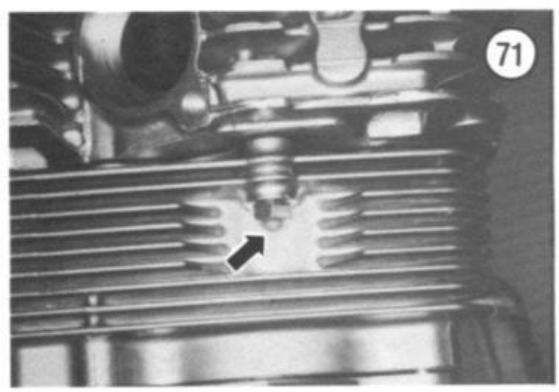
13. Place a clean shop rag into the cam chain tunnel in the cylinder to prevent the entry of foreign matter.

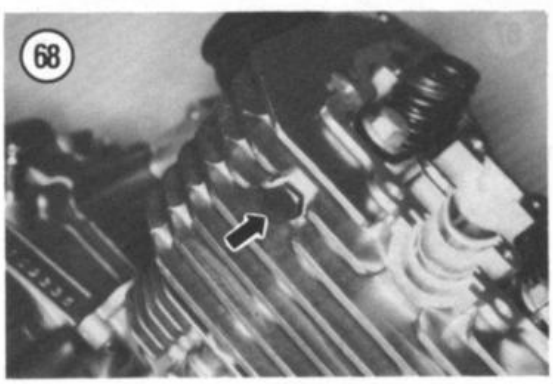
NOTE

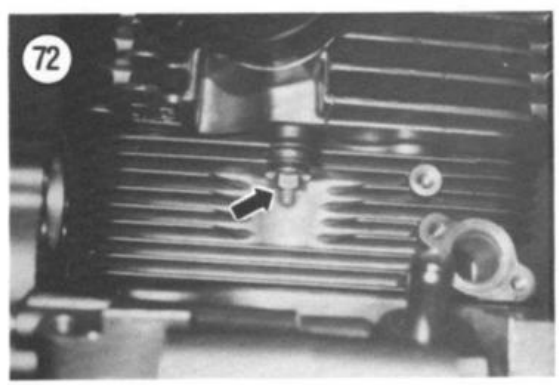
After removing the cylinder head, check the top and bottom mating surfaces of each part for any indications of leakage. Also check the cylinder head gasket for signs of leakage. A blown cylinder head

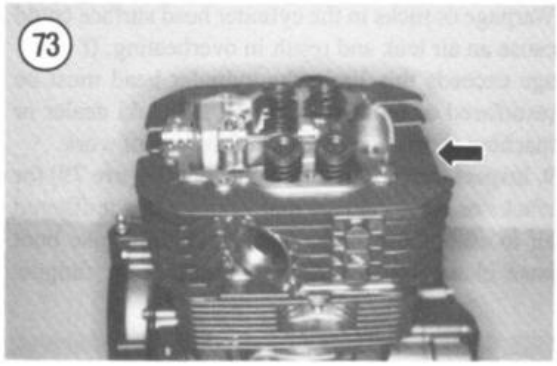


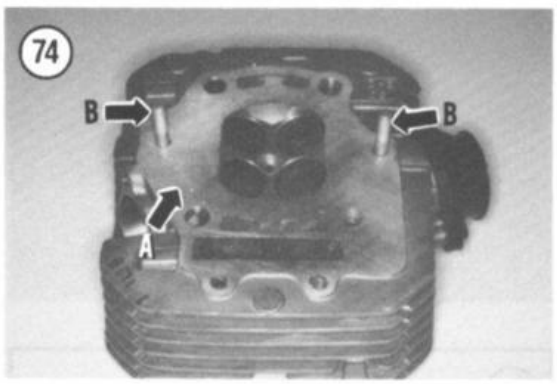


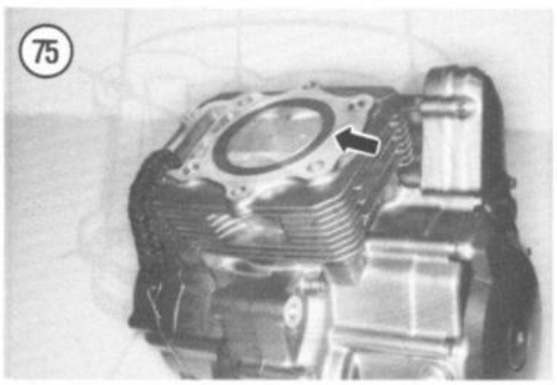


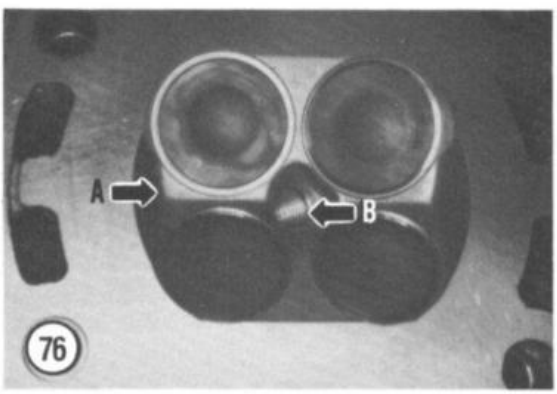












gasket could indicate possible cylinder head warpage or other damage.

Cylinder Head Inspection

1. Thoroughly clean the outside of the cylinder head. Use a stiff brush, soap and water and clean out all road dirt and mud from the cooling fins. If necessary, use a piece of wood and scrape away any lodged dirt and mud. Clogged cooling fins can cause overheating leading to possible engine damage.

2. Remove all traces of gasket residue from the cylinder head (A, **Figure 74**) and cylinder (**Figure 75**) mating surfaces. Do not scratch the gasket surface.

CAUTION

If the combustion chamber is cleaned while the valves are removed, you will damage the valve seat surfaces. A damaged or even slightly scratched valve seat will cause poor valve seating.

3. Without removing the valves, remove all carbon deposits from the combustion chamber (A, **Figure 76**). Use a fine wire brush dipped in solvent or make a scraper from hardwood. Take care not to damage the cylinder head, valves or spark plug threads.

NOTE

When using a tap to clean spark plug threads, coat the tap with an aluminum tap cutting fluid or kerosene.

NOTE

Aluminum spark plug threads are commonly damaged due to galling, cross-threading and over tightening. To prevent galling, apply an anti-seize compound on the plug threads before installation and do not over tighten.

4. Examine the spark plug threads (B, **Figure 76**) in the cylinder head for damage. If damage is minor or if the threads are dirty or clogged with carbon, use a spark plug thread tap (**Figure 77**) to clean the threads following the manufacturer's instructions. If thread damage is severe, the threads can be restored by installing a steel thread insert. Thread insert kits can be purchased at automotive supply stores or you can have the inserts installed by a Suzuki dealer or machine shop.

5. After all carbon is removed from combustion chambers, and valve ports and the spark plug thread holes are repaired, clean the entire head in solvent and dry with compressed air.

NOTE

If the cylinder head was bead-blasted, make sure to clean the head thoroughly with solvent and then with hot water and soap afterwards, then rinse with a high-pressure garden hose and plenty of water. Bead-blasting residue grit seats in small crevices and other areas and can be hard to get out. Also, chase each exposed thread with a tap to remove grit between the threads or you may damage a thread later. Residual grit left in the engine will wind up in the oil and cause premature piston, ring and bearing wear.

6. Examine the crown of the piston. The crown should show no signs of wear or damage. If the crown appears pecked or spongy-looking, also check the spark plug, valves and combustion chamber for aluminum deposits. If these deposits are found, the cylinder is suffering from excessive heat caused by a lean fuel mixture or preignition.

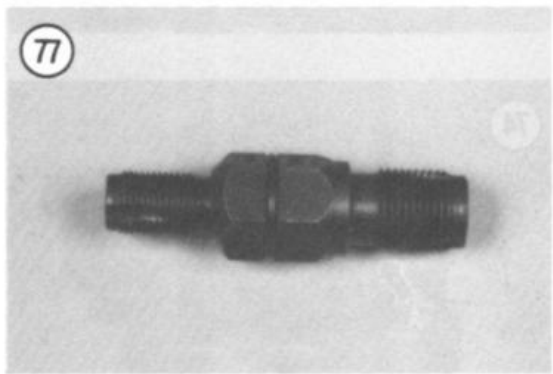
CAUTION

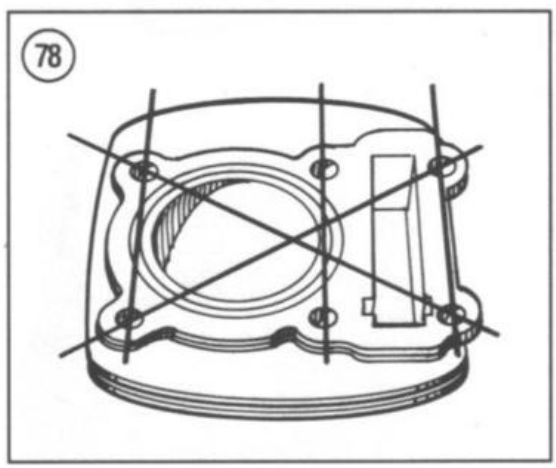
Do not clean the piston crown with the cylinder assembled on the crankcase. Carbon scraped from the top of the piston could fall between the cylinder wall and piston and onto the piston rings. Because carbon grit is very abrasive, premature cylinder, piston and ring wear will occur. If the piston crown is heavily carboned, remove the piston as described in this chapter and clean it. Excessive carbon build-up on the piston crown reduces piston cooling which raises engine compression and causes overheating.

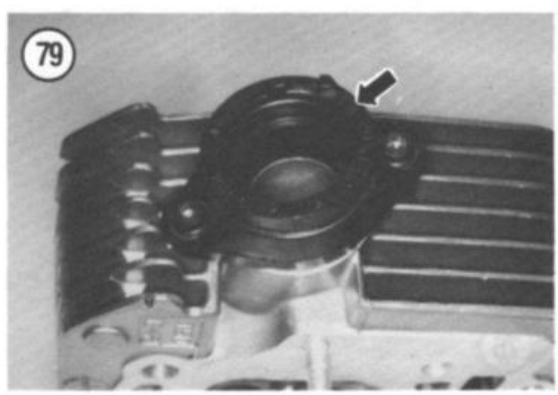
7. Check for cracks in the combustion chamber and exhaust port. A cracked cylinder head must be replaced if it cannot be repaired by welding.

8. After the cylinder head has been thoroughly cleaned, place a straightedge across the gasket surface at several points (**Figure 78**). Measure warp by attempting to insert a feeler gauge between the straightedge and cylinder head at each location. Maximum allowable warpage is listed in **Table 2**. Warpage or nicks in the cylinder head surface could cause an air leak and result in overheating. If warpage exceeds this limit, the cylinder head must be resurfaced or replaced. Consult a Suzuki dealer or machine shop experienced in this type of work.

9. Inspect the carburetor intake boot (**Figure 79**) for cracks or other damage that would allow unfiltered air to enter the engine. Also check the intake boot hose clamp for severe rust, breakage or fatigue.

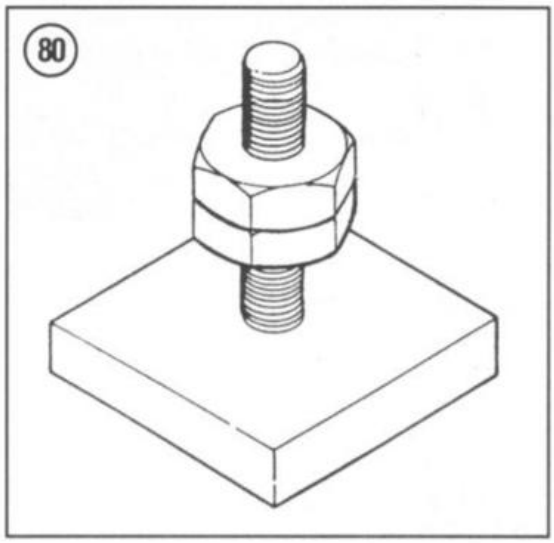


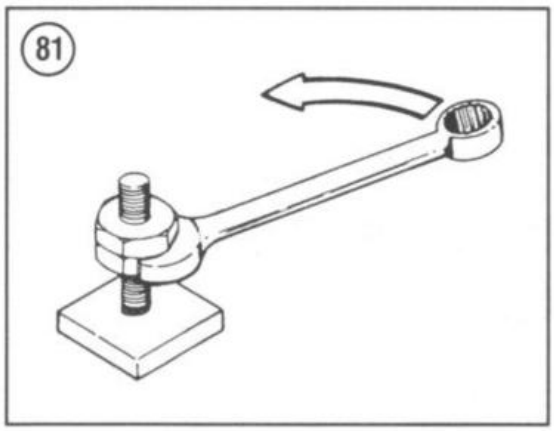


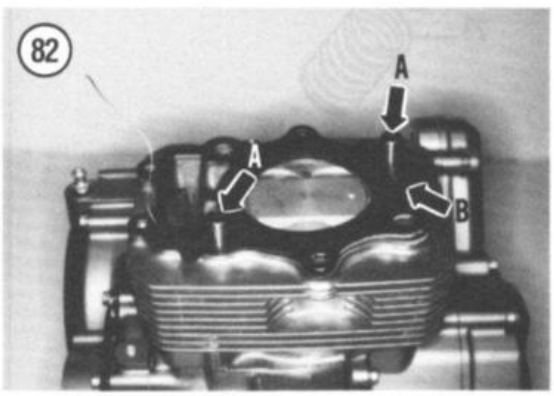


When installing the boot, install a new O-ring between the boot and cylinder head. Tighten the bolts securely.

10. Check the 2 cylinder head lower studs (B, **Figure 74**) for looseness or thread damage. Slight thread damage can be repaired with a thread file or die. If thread damage is severe, replace the damaged stud(s) as follows:







NOTE

Stud replacement will require two wrenches, two nuts, a new stud(s) and a tube of red Loctite (No. 271).

a. Screw two nuts onto the end of the damaged stud as shown in **Figure 80**. If the stud threads are too severely damaged, you may have to remove the stud with a pair of Vise-grip pliers.
b. With 2 wrenches, tighten the nuts against each other.
c. Unscrew the stud with a wrench on the lower nut (**Figure 81**).
d. Clean the tapped hole with solvent and check for thread damage and carbon build-up. If necessary, clean the threads with the correct size metric tap.
e. Remove the nuts from the old stud and install them on the end of a new stud.
f. Tighten the nuts against each other.
g. Apply red Loctite (No. 271) to the threads of the new stud.
h. Screw the stud into the cylinder head with a wrench on the upper nut. Tighten the stud securely.
i. Remove the nuts from the new stud.

11. Check the valves and valve guides as described in this chapter.

Installation

1. Clean the cylinder head (A, **Figure 74**) and cylinder (**Figure 75**) mating surfaces of all gasket residue.
2. Remove the shop rag from the camshaft chain tunnel in the cylinder.
3. If removed, install the 2 locating dowels (A, **Figure 82**) on the cylinder.
4. Install a new cylinder head gasket (B, **Figure 82**).
5. Untie the camshaft chain wire and guide the cam chain and wire through the cylinder head tunnel and install the cylinder head.
6. Make sure the cylinder head seats squarely against the cylinder (**Figure 73**). Tie the loose end of the wire to the exterior of the engine.
7. Lubricate the cylinder head bolt threads with engine oil.

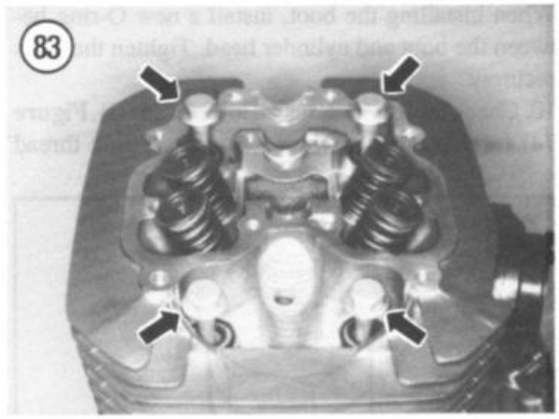
8. Install the cylinder head bolts and washers (**Figure 83**) finger-tight.

9. Install the front (**Figure 71**) and rear (**Figure 72**) nuts and washers finger-tight.

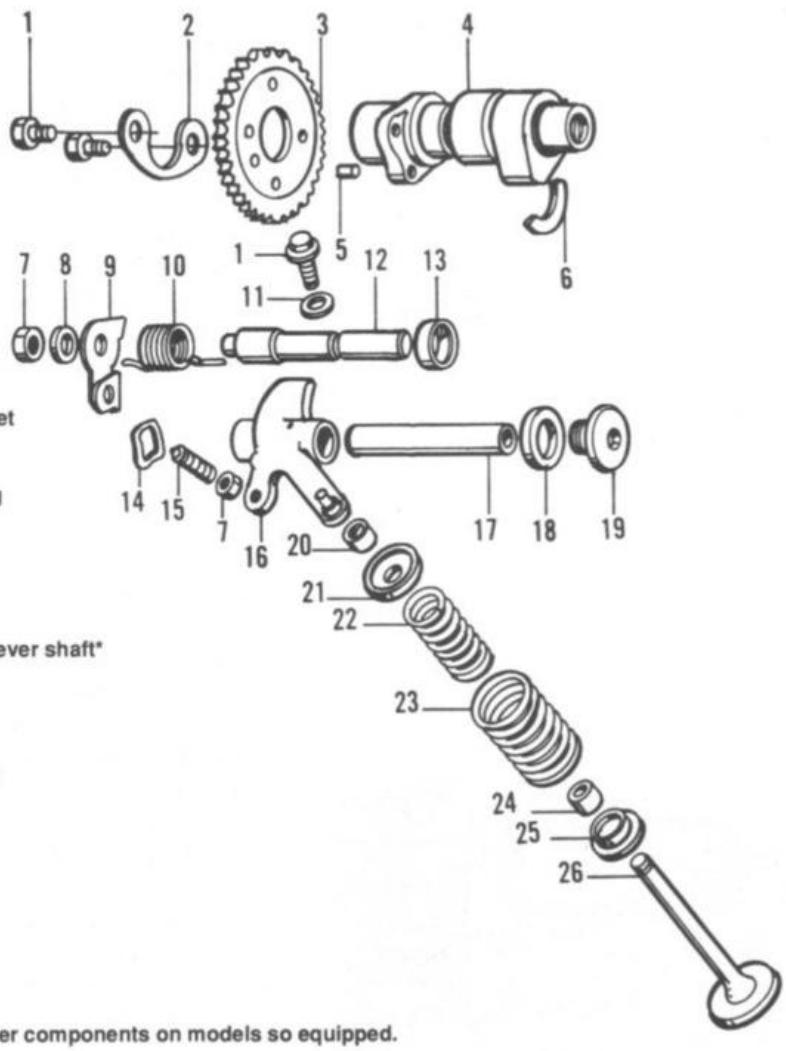
10. Tighten the cylinder head bolts in a crisscross pattern in 2-3 steps to the torque specifications in **Table 3**.

11. Tighten the front (**Figure 71**) and rear (**Figure 72**) nuts to the torque specifications in **Table 3**.

12. Pull up on the camshaft drive chain and make sure it is correctly positioned on the crankshaft sprocket.



84 CAMSHAFT, ROCKER ARMS AND VALVE ASSEMBLY

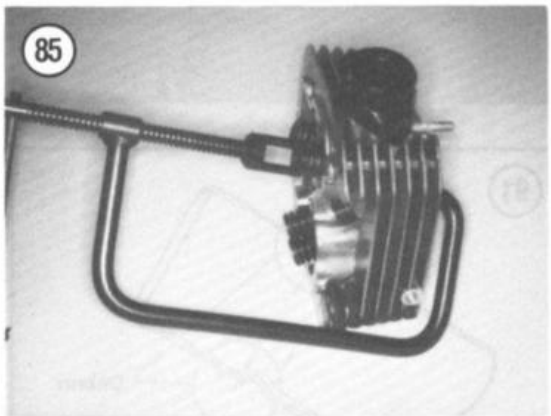


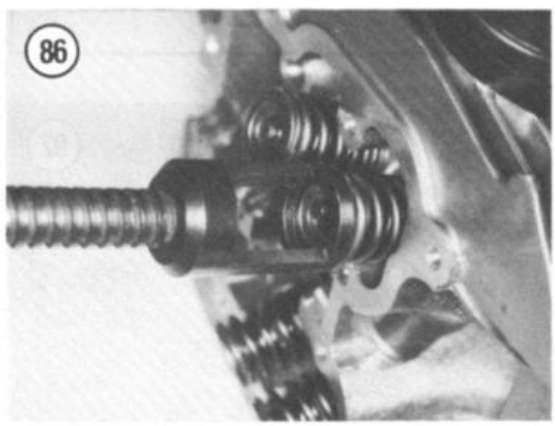
1. Bolt
2. Lockplate
3. Camshaft sprocket
4. Camshaft
5. Pin
6. Camshaft set ring
7. Nut*
8. Washer*
9. Lever*
10. Washer*
11. Washer*
12. Decompression lever shaft*
13. Oil seal*
14. Wave washer
15. Adjust screw
16. Rocker arm
17. Rocker arm shaft
18. Gasket
19. Shaft plug
20. Cotters
21. Spring retainer
22. Inner spring
23. Outer spring
24. Oil seal
25. Spring seat
26. Valve

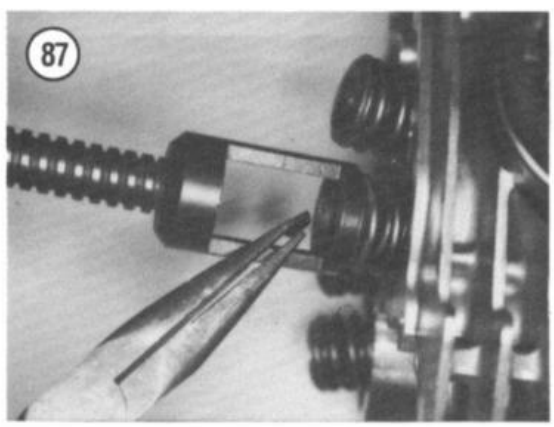
*Decompression lever components on models so equipped.

13. Install the camshaft chain tensioner (**Figure 69**) through the cylinder and make sure it is correctly seated at the bottom.

14. Push the tensioner back and install the bolt and washer (**Figure 68**) securing it to the cylinder. Tighten the bolt securely.







CAUTION

Be sure to install a sealing washer on each side of the oil hose fitting prior to installing the bolt. If either washer is left out there will be a severe oil leak.

15. Move the external oil hose into position on the cylinder head and install the union bolt and both sealing washers (B, **Figure 67**). Tighten the bolt securely.

16. Install the cylinder head cover (A, **Figure 67**) and camshaft as described in this chapter.

VALVES AND VALVE COMPONENTS

Correct valve service requires a number of special tools. The following procedures describe how to check for valve component wear and to determine what type of service is required. In most cases, valve troubles are caused by poor valve seating, worn valve guides and burned valves. A valve spring compressor will be required to remove the valves.

A general practice among those who do their own service is to remove the cylinder head and take it to a machine shop or dealer for inspection and service. Since the cost is low relative to the required effort and equipment, this is the best approach, even for the experienced mechanics.

This procedure is included for those who choose to do their own valve service. Refer to **Figure 84** for this procedure.

Valve Removal

1. Remove the cylinder head as described in this chapter.

2. Install a valve spring compressor (**Figure 85**) squarely over the valve retainer (**Figure 86**) with the other end of the tool placed against valve head.

CAUTION

To avoid loss of spring tension, do not compress the springs any more then necessary to remove the keepers.

3. Tighten valve spring compressor until the valve keepers separate. Lift the valve keepers out through the valve spring compressor (**Figure 87**) with needle nose pliers.

4. Gradually loosen the valve spring compressor and remove it from the head. Remove the spring retainer (**Figure 88**).
5. Remove the outer (**Figure 89**) and inner (**Figure 90**) valve springs.

CAUTION

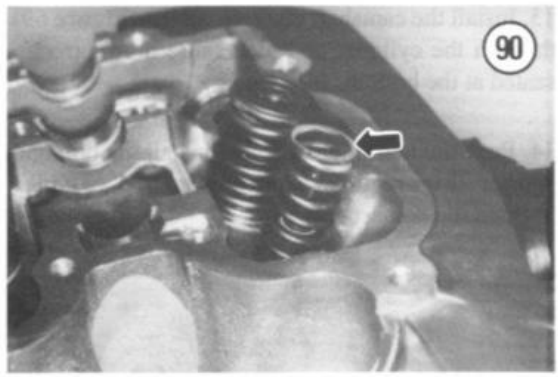
*Remove any burrs from the valve stem groove (**Figure 91**) before pushing the valve down (**Figure 92**). Otherwise a good valve guide(s) will be damaged.*

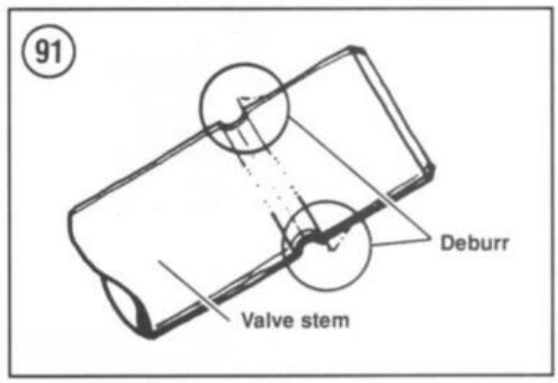
6. Turn the cylinder head over and remove the valve (**Figure 93**) from the cylinder head.
7. If necessary, turn the cylinder head over and pull the oil seal (A, **Figure 94**) off of the valve guide.
8. Remove the spring lower seat (B, **Figure 94**).

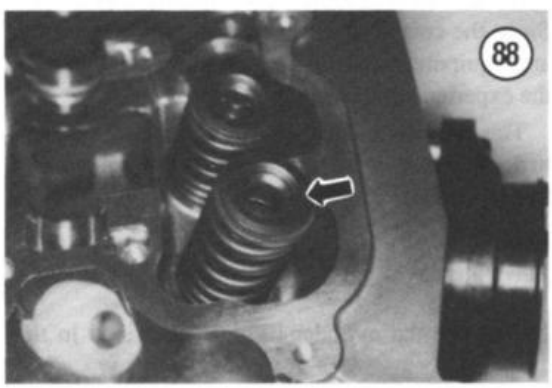
CAUTION

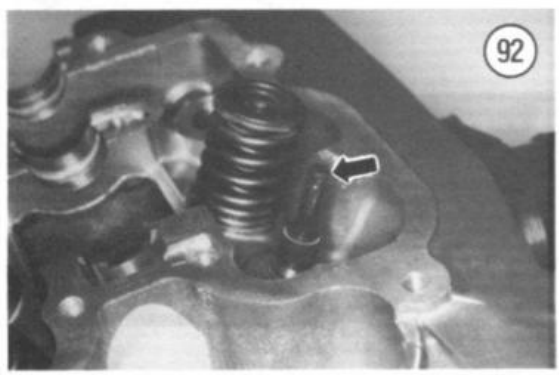
*All component parts of each valve assembly (**Figure 95**) must be kept together. Do not mix with like components from other valves or excessive wear may result.*

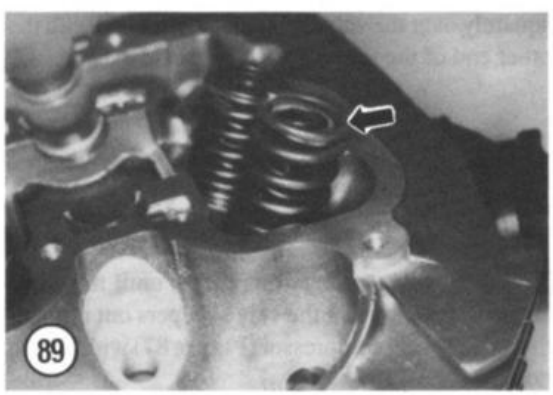
9. Repeat Steps 2-8 and remove remaining valve(s).

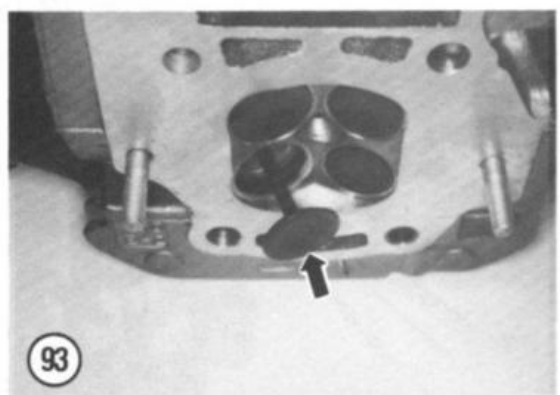


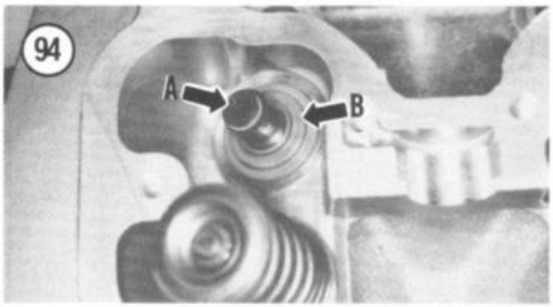


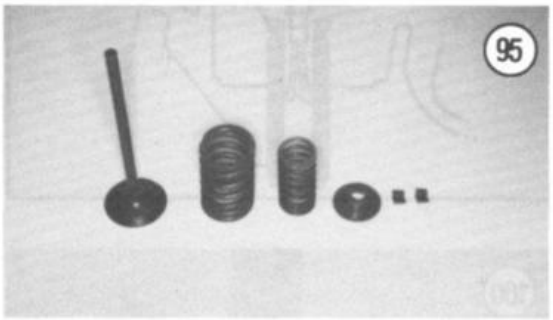


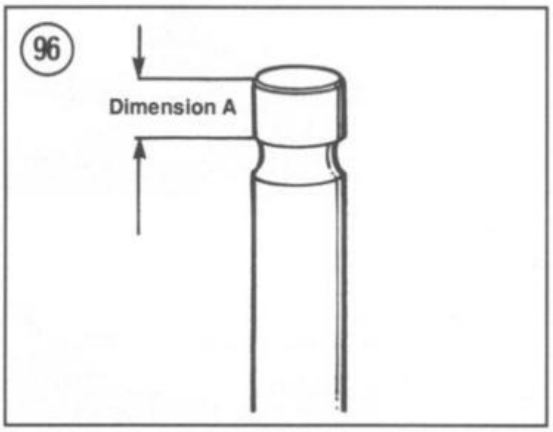


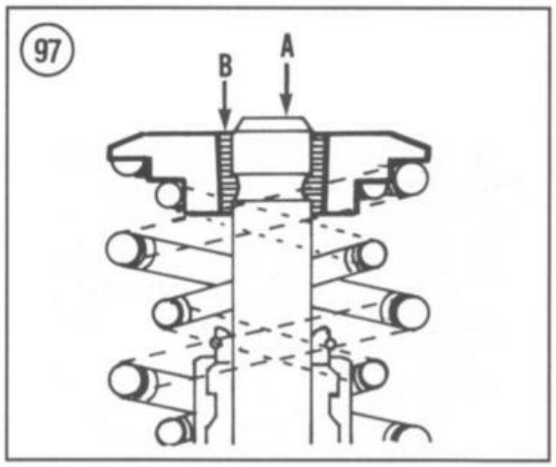












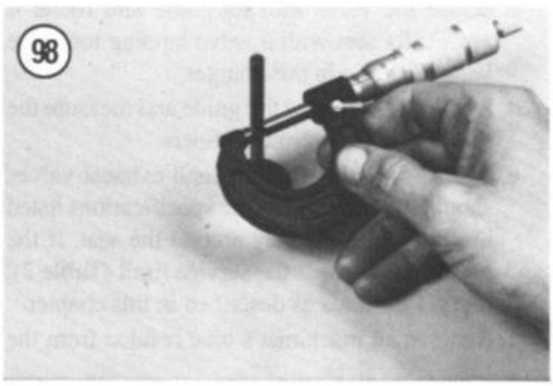
Valve Inspection

1. Clean valves in solvent. Do not gouge or damage the valve seating surface.
2. Inspect the contact surface of each valve for burning. Minor roughness and pitting can be removed by lapping the valve as described in this chapter. Excessive unevenness to the contact surface is an indication that the valve is not serviceable.
3. Inspect the valve stems for wear, pitting and roughness. If these conditions exist the stem end can be resurfaced providing the length (dimension "A") (**Figure 96**) will not be reduced to less than 1.8 mm (0.07 in.). If the length is reduced to less than this dimension, the valve must be replaced. If the valve has been resurfaced, check to make sure the face of the valve stem (A, **Figure 97**) is above the cotters (B, **Figure 97**) after the valve has been installed in the cylinder head.
4. Measure the valve stem outside diameter for wear using a micrometer (**Figure 98**). Compare with specifications in **Table 2**.
5. Measure the thickness of the valve head. Compare to the specification listed in **Table 2**.
6. Remove all carbon and varnish from the valve guides with a stiff spiral wire brush before checking wear.

NOTE

If you do not have the required measuring devices, proceed to Step 7.

7. Measure each valve guide (A, **Figure 99**) at top, center and bottom inside diameter with a small hole gauge (B, **Figure 99**). Then measure the small hole gauge with a micrometer to determine the valve guide inside diameter. Compare measurements with specification in **Table 2**.



8. Subtract the measurement made in Step 3 from the measurement made in Step 6. The difference is the valve guide-to-valve stem clearance. See **Table 2** for correct clearance. Replace any guide and/or valve that is not within tolerance. Valve guide replacement is described later in this chapter.

9. If a small hole gauge is not available, insert each valve in its guide. Hold the valve just slightly off its seat and rock it sideways. If the valve rocks more than slightly, the guide is probably worn and should be replaced. As a final check, take the cylinder head to a dealer or machine shop and have the valve guides measured.

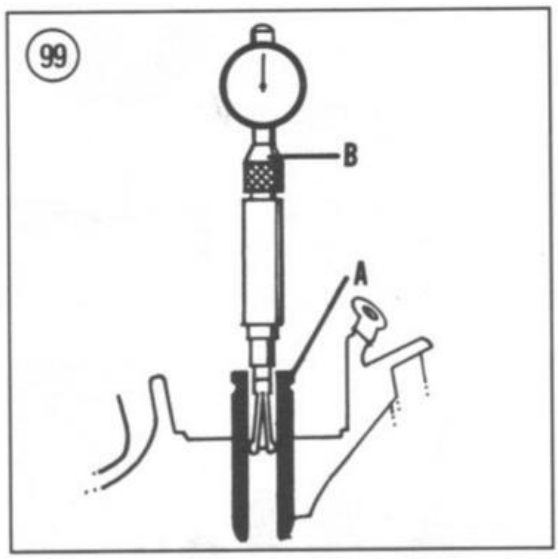
10. Check the inner and outer valve springs as follows:

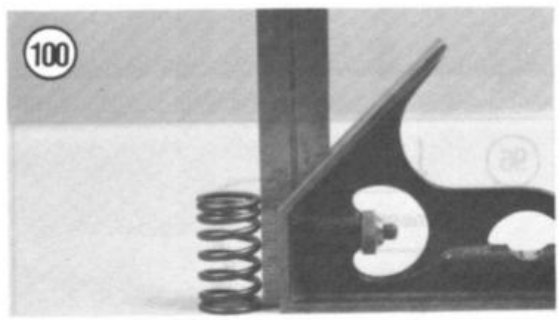
a. Check each of the valve springs for visual damage.
b. Use a square and check each spring for distortion or tilt (**Figure 100**). Compare to specifications in **Table 2**.
c. Measure the valve spring length with a vernier caliper (**Figure 101**). All should be no shorter in length than specified in **Table 2** with no bends or other distortion.
d. Replace defective springs as a set.

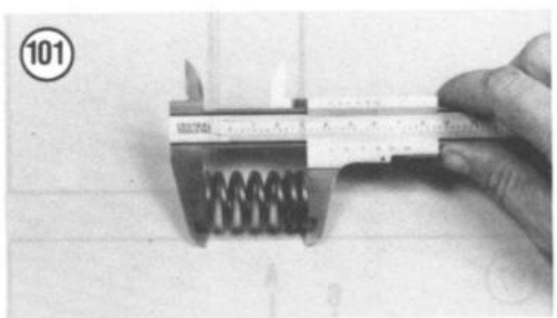
11. Check the valve spring retainer and valve keepers. If they are in good condition, they may be reused.

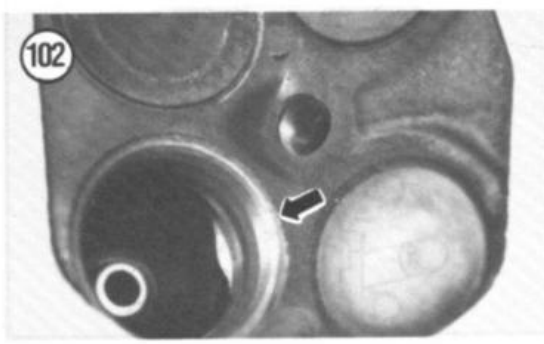
12. Inspect valve seats (**Figure 102**). If worn or burned, they may be reconditioned as described in this chapter. Seats and valves in near-perfect condition can be reconditioned by lapping with fine carborundum paste. Lapping, however, is always inferior to precision grinding. Check as follows:

a. Clean the valve seat and valve mating areas with aerosol electrical contact cleaner.
b. Coat the valve seat with machinist's blue.
c. Install the valve into its guide and rotate it against its seat with a valve lapping tool. See *Valve Lapping* in this chapter.
d. Lift the valve out of the guide and measure the seat width with vernier calipers.
e. The seat width for intake and exhaust valves should measure within the specifications listed in **Table 2** all the way around the seat. If the seat width exceeds the service limit (**Table 2**), regrind the seats as described in this chapter.
f. Remove all machinist's blue residue from the seats and valves.









13. Check the valve stem runout with a V-block and dial indicator as shown in **Figure 103**. Compare runout to specifications in **Table 2**.

14. Measure the head diameter of each valve with a vernier caliper or micrometer (**Figure 104**). Compare to specifications in **Table 2**.

Valve Guide Replacement

The valve guides must be removed and installed with special tools that can be ordered from a Suzuki dealer or motorcycle accessory store. The required special tools are listed as follows:

a. Valve guide remover, Suzuki part No. 09916-44310.
b. 10.8 mm valve guide reamer, Suzuki part No. 09916-34580.
c. 5.0 mm valve guide reamer, Suzuki part No. 09916-34570.
d. 5.0 mm valve guide reamer handle, Suzuki part No. 09916-34541.

Before driving the valve guides out of the cylinder head, place the new valve guides in the freezer. The freezing temperature will reduce the outer diameter of the new guides slightly and make installation easier.

CAUTION

Before heating the cylinder head in this procedure to remove the valve guide(s), wash the cylinder head thoroughly with detergent and water. Rinse and rewash the cylinder head as required to remove all traces of oil and other debris.

CAUTION

*Even though the cylinder head has been washed there **may** be a residual oil or solvent odor left in the oven after heating the cylinder head. If you use a household oven, first check with the person who uses the over for food preparation to avoid getting into trouble.*

1. The valve guides are installed with a slight interference fit. The cylinder head must be heated to a temperature of approximately 212-300° F (100-150° C) in a shop oven or on a hot plate.

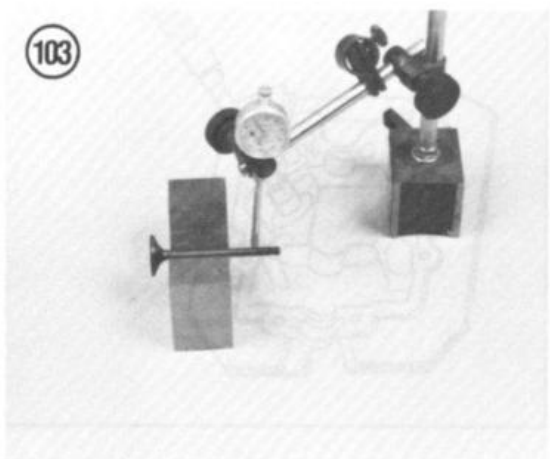
CAUTION

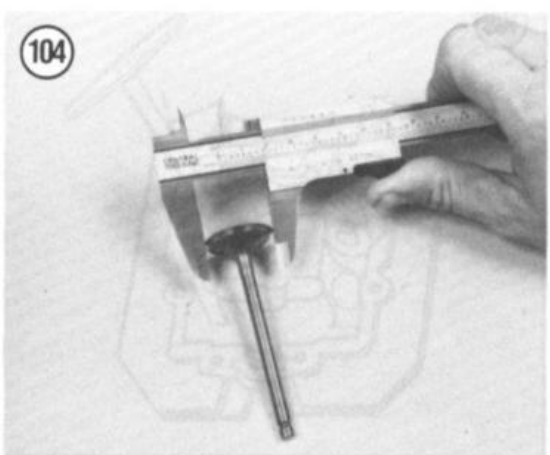
Do not heat the cylinder head with a torch (propane or acetylene)—never bring a flame into contact with the cylinder head. The direct heat may cause warpage of the cylinder head.

WARNING

Heavy gloves must be worn when performing this procedure—the cylinder head will be very hot.

2. Remove the cylinder head from the oven or hot plate and place onto wood blocks with the combustion chamber facing *up*.
3. Drive the old valve guide out from the combustion chamber side of the cylinder head (**Figure 105**) with the valve guide remover.
4. After the cylinder head cools, check the guide bore for carbon or other contamination. Clean the bore thoroughly with the 10.8 mm reamer (**Figure 106**).
5. Install a new ring onto the valve guide. Do *not* use a ring from a valve guide that has been removed as it is no longer true.



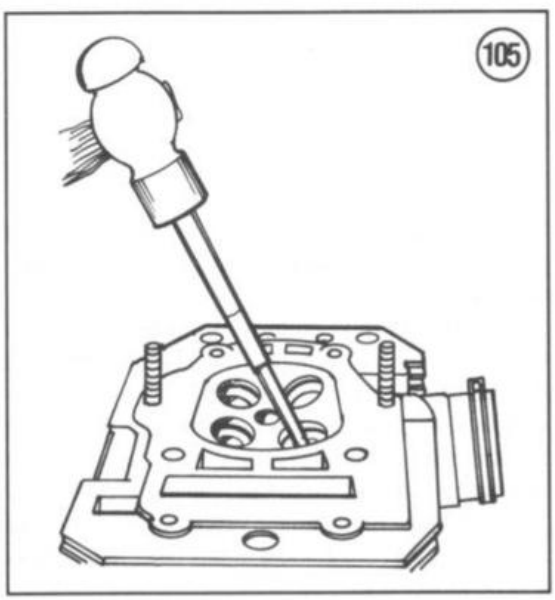


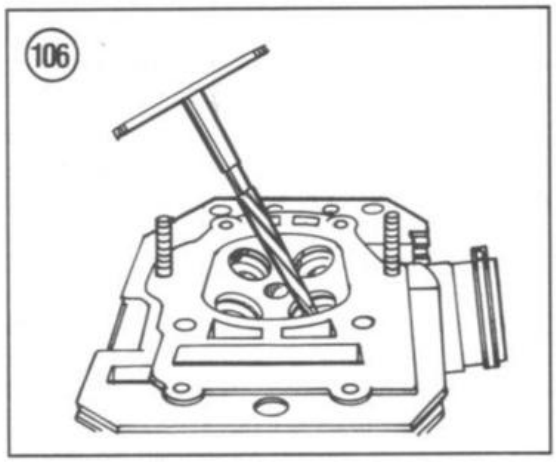
6. Reheat the cylinder head to approximately 212-300° F (100-150° C).
7. Remove the cylinder head from the oven or hot plate and place it on wood blocks with the combustion chamber facing *down*.
8. Using the valve guide remover (also used for installation), install the new valve guide (**Figure 107**) until the ring bottoms out on the cylinder head.
9. After the cylinder head has cooled to room temperature, ream and refinish the new valve guides as follows:
   a. Coat the valve guide and valve guide reamer with cutting oil.
   b. Refinish the new valve guide bore by rotating the 5.0 mm reamer *clockwise* only (**Figure 108**). Do not turn the reamer counterclockwise.
10. Clean the cylinder head thoroughly in solvent. Lightly oil the valve guides to prevent rust.

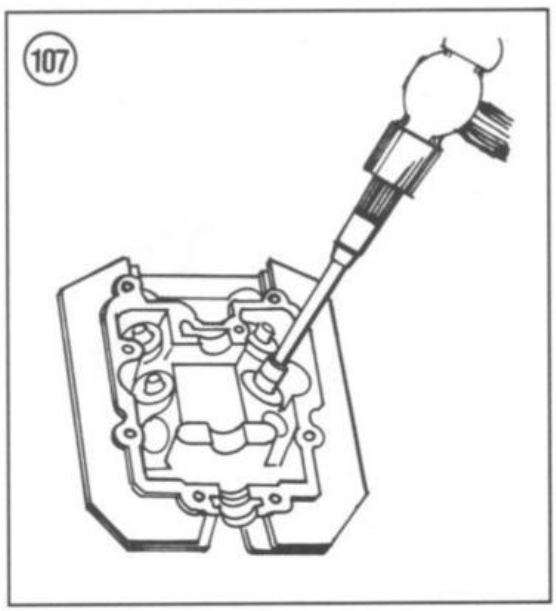
Valve Seat Reconditioning

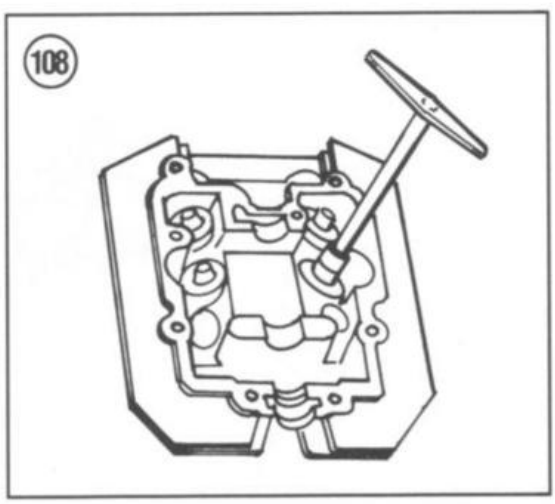
The valve seats must be cut with special tools that are available from a Suzuki dealer or motorcycle accessory dealer. The following tools will be required:

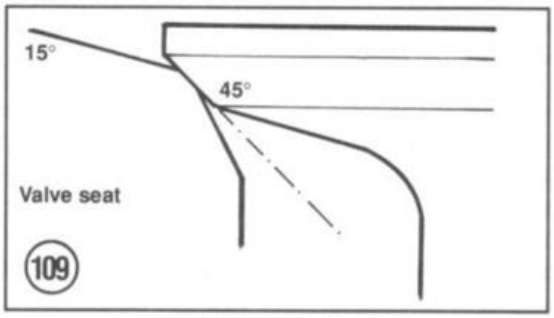
a. Valve seat cutters (see Suzuki dealer for part numbers).
b. Vernier caliper.
c. Machinist's blue.
d. Valve lapping tool.

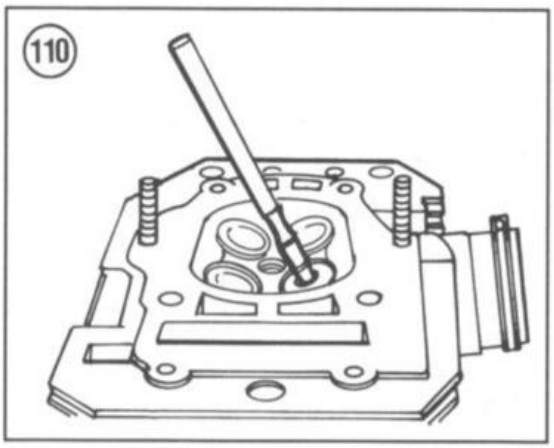


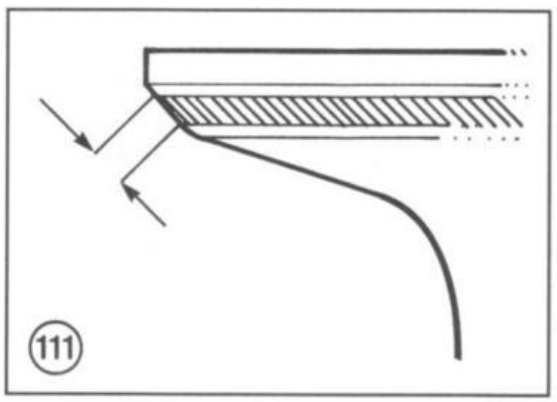


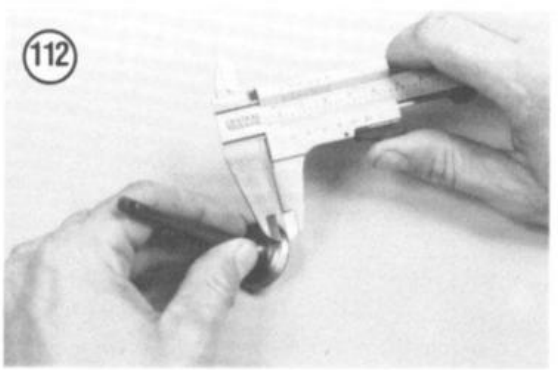












The cylinder head valve seats for both the intake and exhaust valves are cut at two angles, 45° and 15° (**Figure 109**).

NOTE

Follow the manufacturer's instructions when using the valve seat facing equipment.

1. Inspect the valve seats. If worn or burned, they may be reconditioned. Seats and valves in near-perfect condition can be reconditioned by lapping with fine carborundum paste. Lapping, however, is always inferior to precision grinding. Check as follows:
   a. Clean the valve seat and valve mating areas with aerosol electrical contact cleaner.
   b. Coat the valve seat with machinist's blue.
   c. Install the valve into its guide and rotate it against its seat with a valve lapping tool (**Figure 110**). See *Valve Lapping* in this chapter.
   d. Lift the valve out of the guide and measure the seat width (**Figure 111**) with a vernier caliper (**Figure 112**).
   e. The seat width for intake and exhaust valves should measure within the specifications listed in **Table 2** all the way around the seat. If the seat width exceeds the service limit in **Table 2**, regrind the seats as follows.

CAUTION

*When grinding valve seats, work **slowly** to avoid grinding away too much of the seats. Over grinding the valve seats will sink the valves too far into the cylinder head. Sinking the valves too far may reduce valve clearance and make it impossible to adjust valve clearance. If over grinding occurs, the cylinder head will have to be replaced.*

2. Install a 45° cutter onto the valve tool and lightly cut the valve seat to remove roughness.

3. Measure the valve seat with a vernier caliper. Record the measurement to use as a reference point when performing the following.

CAUTION

The 15° cutter removes material quickly. Work carefully and slowly and check your progress often.

4. If the contact area is too low or too narrow (**Figure 113**), use the 45° cutter to raise and widen the contact area.

5. If the contact area is too high or too wide (**Figure 114**), use the 15° cutter to lower and narrow the contact area.

CAUTION

*After the final cut is made, do **not** use any valve lapping compound. The finished valve seat should have a velvety smooth surface—not a highly polished or shiny surface. The soft surface will provide the best type of surface for the final valve seating which occurs during the first few seconds of engine operation.*

6. After the desired seat position is obtained, use the 45° cutter very lightly to clean up any burrs caused by the previous cutting procedures.

Valve Lapping

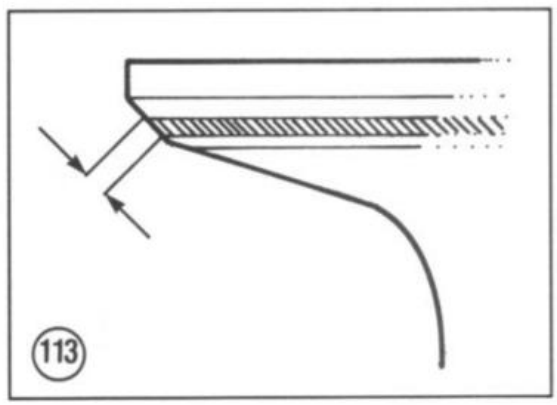
CAUTION

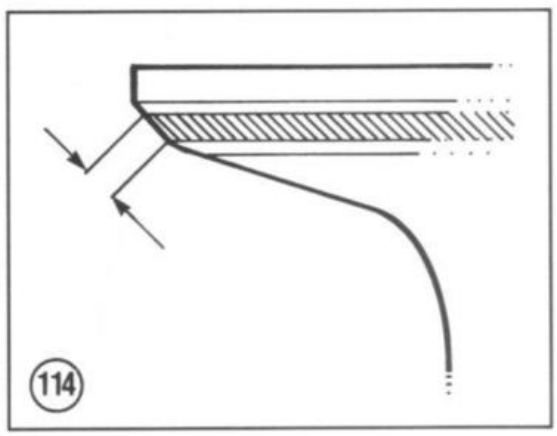
*Do **not** use this procedure after grinding the valve seats. See previous **CAUTION**.*

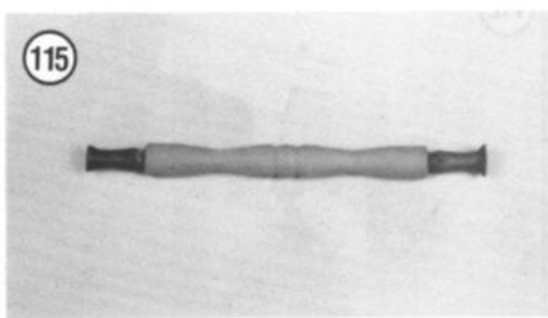
Valve lapping is a simple operation which can restore the valve seal without machining if the amount of wear or distortion is not too great.

This procedure should only be performed after determining that valve seat width and outside diameter are within specifications.

1. Smear a light coating of fine grade valve lapping compound on the seating surface of the valve.
2. Insert the valve into the head.
3. Wet the suction cup of the lapping stick (**Figure 115**) and stick it onto the head of the valve. Lap the valve to the seat by spinning the lapping stick in both directions. Every 5 to 10 seconds, rotate the valve 180° in the valve seat. Continue this action until the mating surfaces on the valve and seat are smooth and equal in size.
4. Closely examine valve seat in cylinder head. It should be smooth and even with a smooth, polished seating "ring."
5. Thoroughly clean the valves and cylinder head in solvent to remove all grinding compound. Any compound left on the valves or the cylinder head will end up in the engine and cause excessive wear and damage.
6. After the lapping has been completed and the valve assemblies have been reinstalled into the head, the valve seal should be tested. Check the seal of each valve by pouring solvent into each of the intake and exhaust ports. There should be no leakage past the seat. If leakage occurs, combustion chamber will appear wet. If fluid leaks past any of the seats, disassemble that valve assembly and repeat the lapping procedure until there is no leakage.







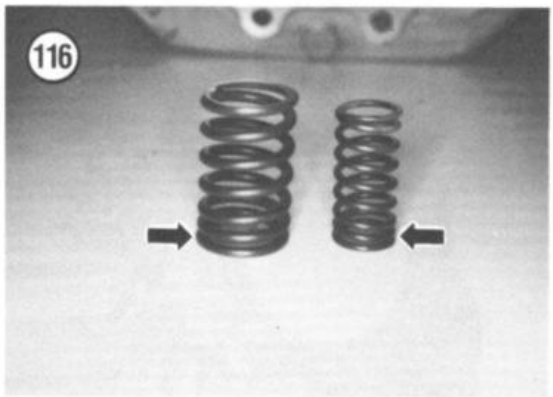
Valve Installation

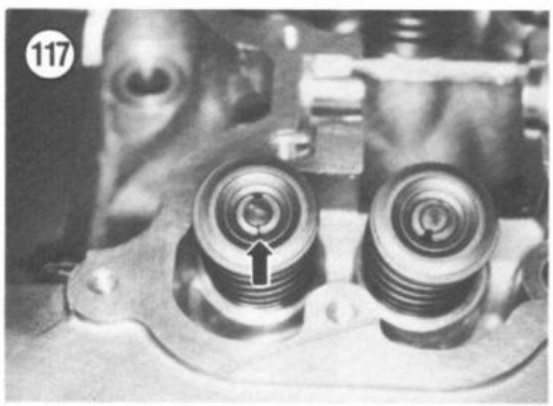
1. Coat a valve stem with molybdenum disulfide paste and install the valve into its correct guide (**Figure 93**).

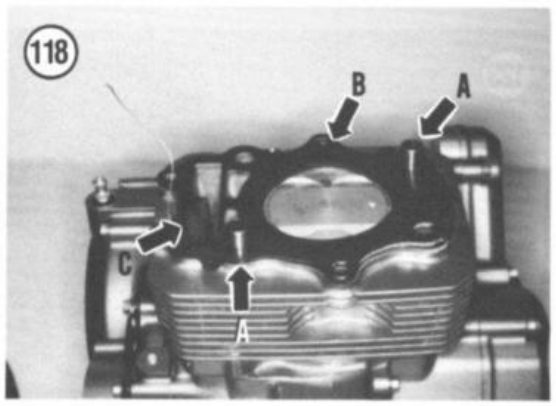
2. Install the spring lower seat (B, **Figure 94**).

NOTE

Oil seals should be replaced whenever a valve is removed.







3. Carefully slide a new oil seal (A, **Figure 94**) over the valve and seat it onto the end of the valve guide.

NOTE

*Install valve springs with the narrow pitch end (end with coils closest together) facing the cylinder head. See **Figure 116**.*

4. Install the inner (**Figure 90**) and outer valve springs (**Figure 89**).

5. Install the upper valve spring seat (**Figure 88**).

6. Install a valve spring compressor (**Figure 85**) squarely over the valve retainer (**Figure 86**) with the other end of tool placed against valve head.

CAUTION

To avoid loss of spring tension, do not compress the springs any more then necessary to install the keepers.

7. Apply a light coat of cold grease to the valve keepers to help keep them in place. Install the valve keepers (**Figure 87**).

8. After releasing tension from the compressor, examine valve keepers and make sure they are seated correctly (**Figure 117**).

9. After the springs have been installed, gently tap on the end of the valve stem with a soft aluminum or brass drift and hammer. This will ensure that the keepers are properly installed and seated.

10. Repeat Steps 1-9 for remaining valve(s).

11. Check valve clearance and adjust as necessary as described in Chapter Three.

CYLINDER BLOCK

The alloy cylinder block has a pressed-in cast iron cylinder sleeve.

If the cylinder is out of specification, the cylinder can be bored to 0.5 mm (0.020 in.) oversize and an additional 0.5 mm (0.020 in.) to a final 1.0 mm (0.040 in.) oversize.

1. Remove the cylinder head as described in this chapter.

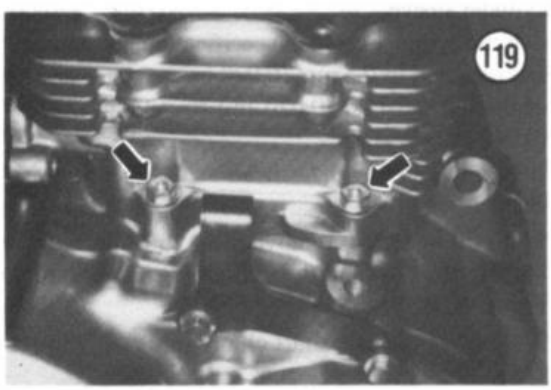
2. If still installed, remove the 2 locating dowels (A, **Figure 118**) and the cylinder head gasket (B, **Figure 118**).

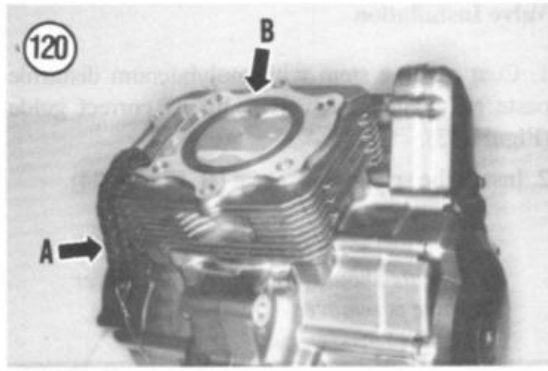
3. Remove the camshaft chain guide (C, **Figure 118**).

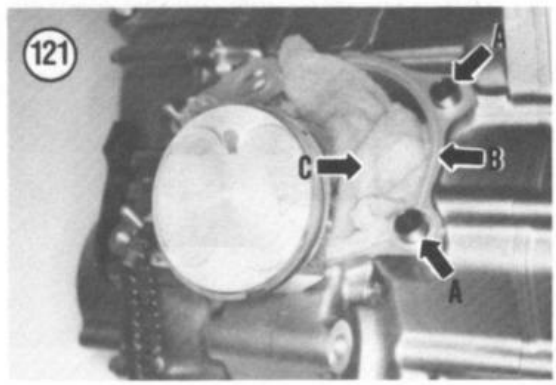
4. Remove the cylinder base nuts and washers (**Figure 119**) securing the cylinder block to the crankcase.
5. Loosen the cylinder block by tapping around the perimeter with a rubber or plastic mallet.
6. Untie the wire securing the camshaft drive chain (A, **Figure 120**) to the exterior of the engine.
7. Pull the cylinder block (B, **Figure 120**) straight up and off the crankcase. Feed the camshaft drive chain and wire through the chain channel in the cylinder block. Retie the wire to the crankcase.
8. Remove the locating dowels (A, **Figure 121**) on the left-hand side.
9. Remove the cylinder base gasket (B, **Figure 121**) and discard it.
10. Stuff a clean shop rag (C, **Figure 121**) into the crankcase opening to prevent foreign objects from falling into the crankcase.
11. If necessary, remove the piston as described in this chapter.

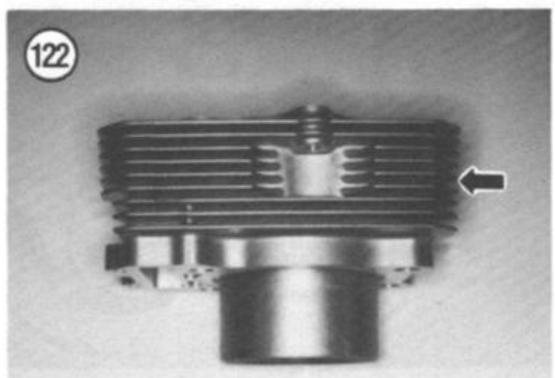
Inspection

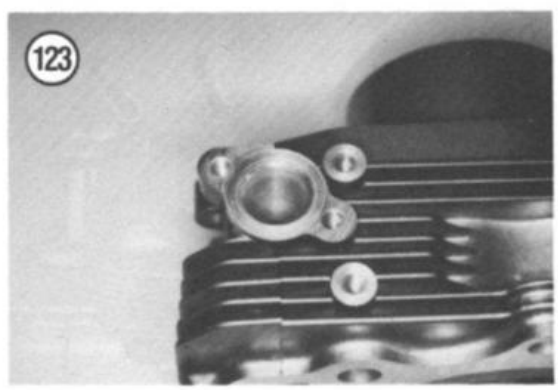
1. Thoroughly clean the outside of the cylinder block. Use a stiff brush, soap and water and clean out all road dirt and mud from the cooling fins (**Figure 122**). If necessary, use a piece of wood and scrape away all lodged dirt and mud. Clogged cooling fins can cause overheating leading to possible engine damage.
2. Inspect the threaded holes (**Figure 123**) on the backside of the cylinder for damage. Clean up with a proper size thread tap if necessary.
3. Wash the cylinder block in solvent to remove any oil and carbon particles. The cylinder bore must be cleaned thoroughly before attempting any measurement as incorrect readings may be obtained.











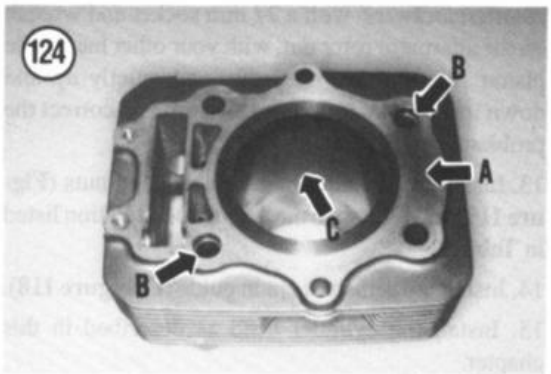
4. Remove all gasket residue from the top (A, **Figure 124**) and bottom (A, **Figure 125**) gasket surfaces.

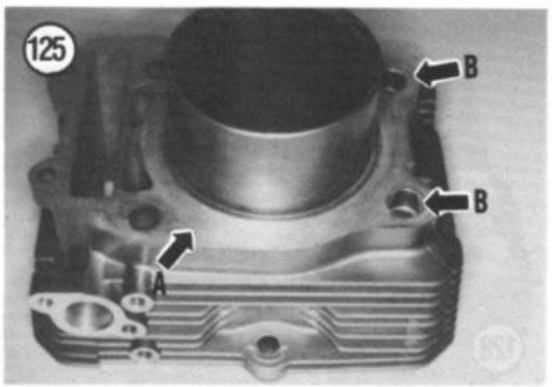
5. Check the locating dowel pin holes (B, **Figure 124** and B, **Figure 125**) for cracks or other damage.

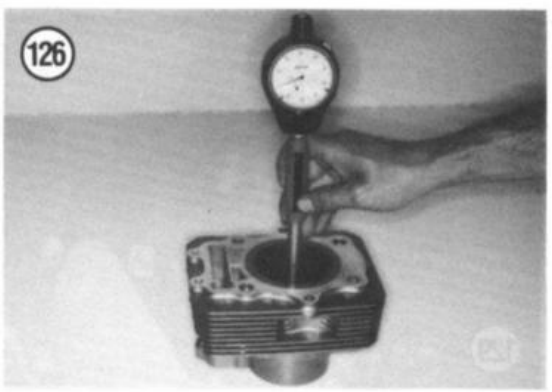
6. Measure the cylinder bore with a bore gauge (**Figure 126**) or inside micrometer. Then measure the bore gauge with a micrometer to determine the bore diameter. Measure the cylinder bore at the points shown in **Figure 127**. Measure in 2 axes—in line with the piston pin and at 90° to the pin. If the taper or out-of-round is greater than specifications listed in **Table 2**, the cylinder must be rebored to the next oversize and a new piston and rings installed.

NOTE

*The new piston should be obtained first before the cylinder is bored so that the piston can be measured. The cylinder must be bored to match that specific piston. Piston-to-cylinder clearance is specified in **Table 2**.*







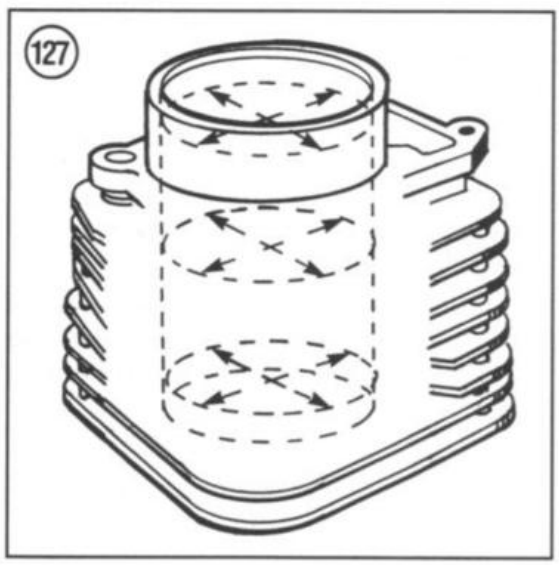
7. If the cylinder is not worn past the service limit, check the bore (C, **Figure 124**) carefully for scratches or gouges. The bore still may require boring and reconditioning.

8. If the cylinder requires boring; remove all dowel pins from the cylinder block before taking it to a dealer or machine shop for service.

9. After the cylinder has been serviced, wash the bore in hot soapy water. This is the only way to clean the cylinder wall of the fine grit material left from the bore or honing job. After washing the cylinder wall, run a clean white cloth through it. The cylinder wall should show no traces of grit or other debris. If the rag is dirty, the cylinder wall is not clean and must be rewashed.

CAUTION

A combination of soap and water is the only solution that will completely clean the cylinder wall. Solvent and kerosene cannot wash fine grit out of cylinder crevices. Grit left in the cylinder will act



as a grinding compound and cause premature wear to the new rings.

10. Wipe the cylinder bore dry with cloths and compressed air. Apply a light coat of fresh engine oil to keep the cylinder wall from rusting.

Installation

1. Check that the top (A, **Figure 124**) and bottom (A, **Figure 125**) cylinder mating surfaces are clean of all old gasket residue.
2. Check that the top surface of the crankcase is clean of all old gasket residue.

NOTE

***Figure 128** is shown with the piston removed for clarity.*

3. If removed, install the 2 locating dowels (A, **Figure 128**) on the left-hand side of the cylinder.
4. Insert the camshaft drive chain through the opening in the gasket and install a new cylinder base gasket (B, **Figure 128**). Make sure all holes align.
5. If removed, install the piston, as described in this chapter.

CAUTION

Make sure the piston pin circlips are installed and seated correctly.

6. Lubricate the cylinder wall and piston liberally with engine oil prior to installation.
7. Untie the wire securing the camshaft drive chain to the crankcase.
8. Feed the wire through the chain channel in the cylinder block.

CAUTION

If using a hose clamp, don't tighten the clamp any more than necessary to compress the rings. If the rings can't slip through easily, the clamp may gouge the rings.

9. Carefully align the cylinder with the piston and install the cylinder (**Figure 129**) Compress each ring as it enters the cylinder with your fingers or by using an aircraft type hose clamp.

NOTE

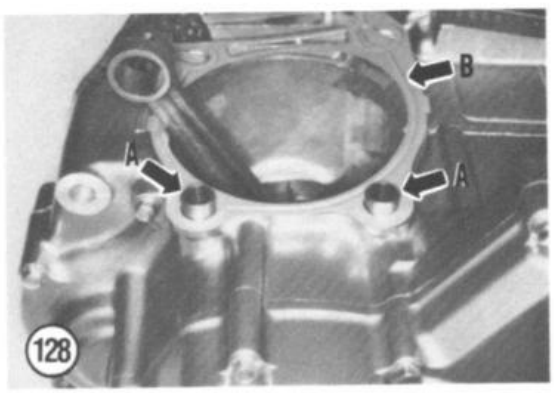
Once the cylinder is installed, pull the camshaft chain and wire up through the cylinder block.

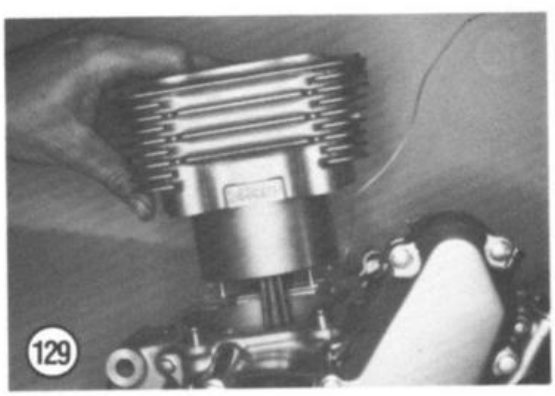
10. Retie the camshaft drive chain wire to the exterior of the engine (A, **Figure 120**).
11. Push the cylinder (B, **Figure 120**) all the way down.

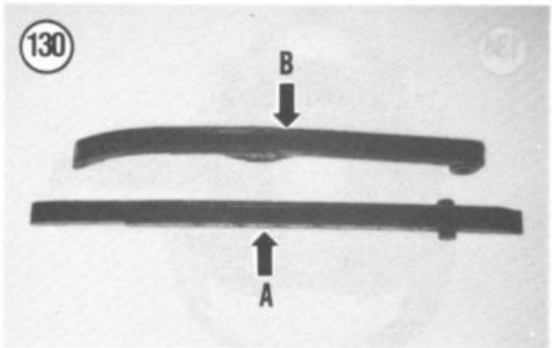
12A. On models equipped with a kickstarter, while holding the cylinder down with one hand, operate the kickstarter lever with your other hand. The piston should move smoothly and quietly up and down in the bore. If it doesn't—stop and correct the problem.

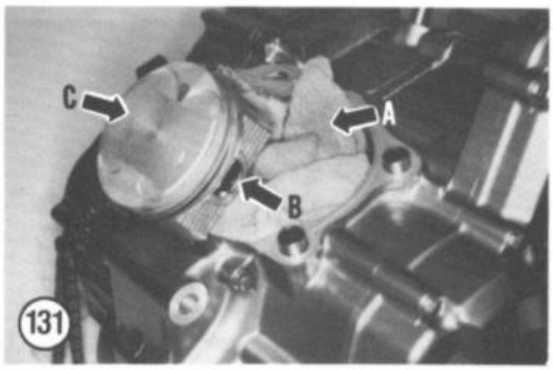
12B. On electric start models, while holding the cylinder down with one hand, rotate the engine *counterclockwise* with a 27 mm socket and wrench on the alternator rotor nut, with your other hand. The piston should move smoothly and quietly up and down in the bore. If it doesn't—stop and correct the problem.

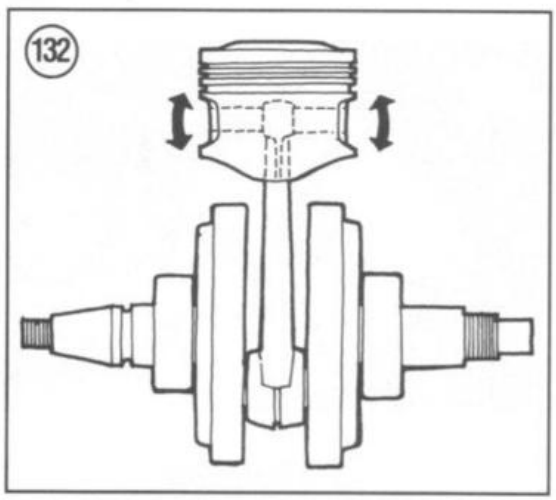
13. Install the cylinder base washers and nuts (**Figure 119**) and tighten to the torque specification listed in **Table 3**.
14. Install the camshaft chain guide (C, **Figure 118**).
15. Install the cylinder head as described in this chapter.

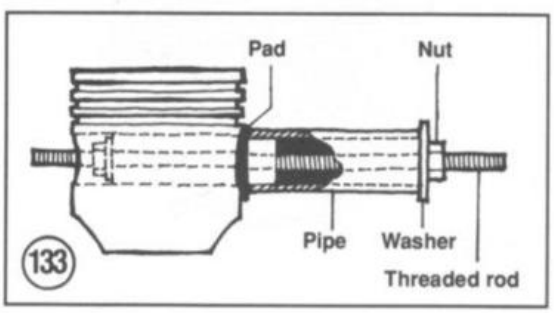












CAMSHAFT CHAIN GUIDE AND TENSIONER

The camshaft rear tensioner can be removed after removing the cylinder head cover. The camshaft chain front guide can be removed after removing the cylinder head.

Check the camshaft drive chain front guide (A, **Figure 130**) and rear tensioner (B, **Figure 130**) for wear, damage or cracks. Inspect the pivot point of the rear tensioner for wear or damage. If either the guide or the tensioner are worn or damaged, replace them as a set.

If the chain front guide and rear tensioner are worn or damaged, also check the camshaft drive chain for wear or damage.

PISTON

Piston Removal/Installation

1. Remove the cylinder as described in this chapter.
2. Stuff the crankcase opening below the piston with a clean shop rag (A, **Figure 131**) to prevent objects from falling into the crankcase.
3. Before removing the piston, hold the rod tightly and rock the piston (**Figure 132**). Any rocking motion (do not confuse with the normal sliding motion) indicates wear on the piston pin, rod bushing, pin bore, or more likely, a combination of all three.
4. Remove the circlip from the piston pin bore (B, **Figure 131**) on each side.

NOTE

Discard the piston circlips. New circlips must be installed during reassembly.

5. Push the piston pin out of the piston by hand. If the pin is tight, use a homemade tool (**Figure 133**) to remove it. Do not drive the piston pin out as this action may damage the piston pin, connecting rod or piston.
6. Lift the piston (C, **Figure 131**) off the connecting rod.
7. Inspect the piston as described in this chapter.

NOTE

New piston circlips should be installed.

8. Coat the connecting rod bushing, piston pin and piston with assembly oil.

9. Insert the piston pin through one side of the piston until its end extends slightly beyond the inside of the boss (**Figure 134**).

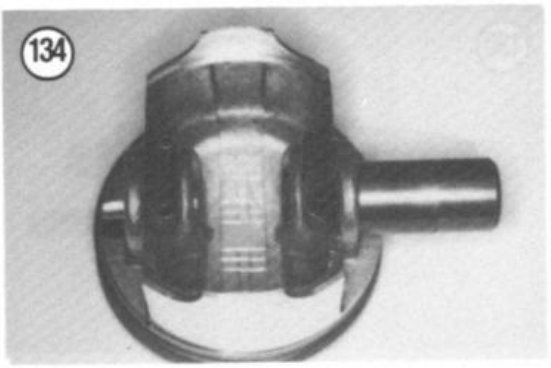
10. Place the piston over the connecting rod so that the arrow on the piston crown (**Figure 135**) faces forward.

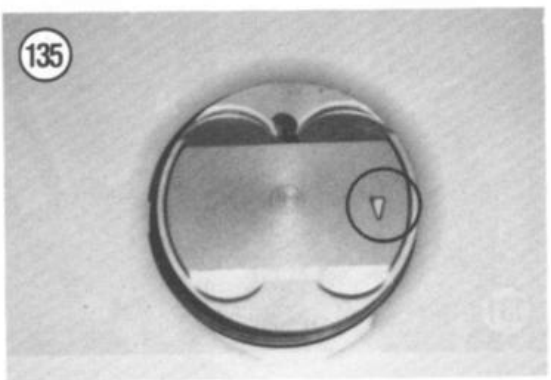
11. Push the piston pin in farther until it starts to enter the connecting rod. Then it may be necessary to move the piston around until the pin enters the connecting rod. Do not force installation or damage may occur. If the pin does not slide easily, use the homemade tool (**Figure 133**) but eliminate the piece of pipe. Push the pin in until it is centered in the piston.

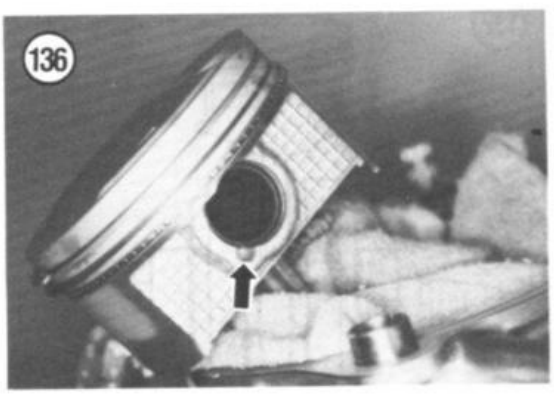
NOTE

*In the next step, install the circlips with the gap away from the cutout in the piston (**Figure 136**).*

12. Install the piston circlip (B, **Figure 131**) into the circlip groove on each side of the piston. Make sure the circlips seat all the way in the circlip grooves.







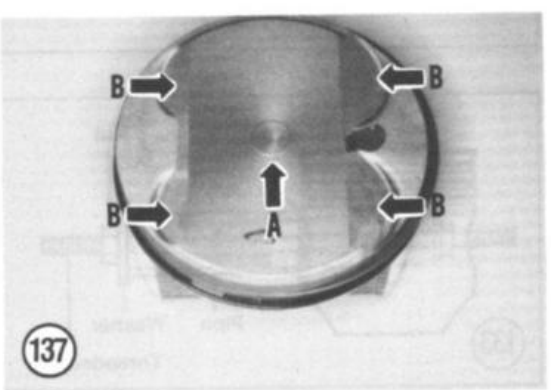
Piston Inspection

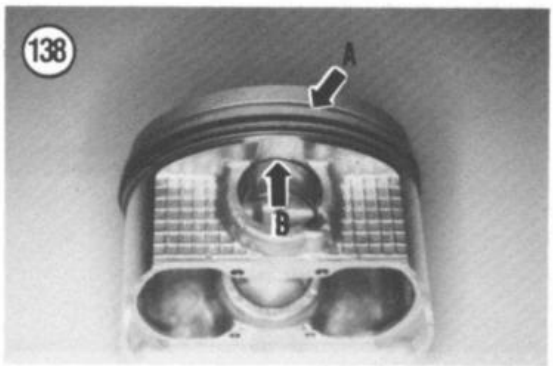
1. Remove the piston rings as described in this chapter.

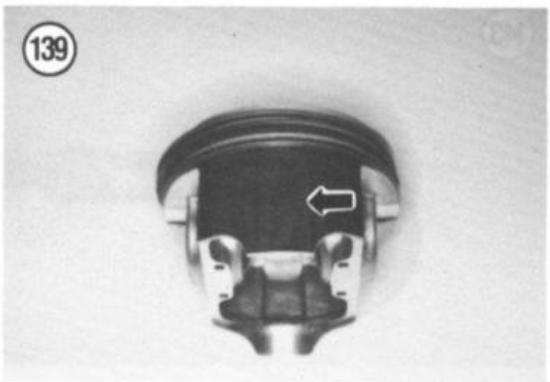
CAUTION

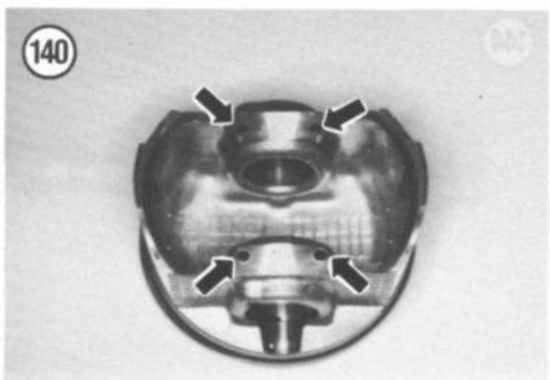
Large carbon accumulations reduce piston cooling and results in detonation and piston damage.

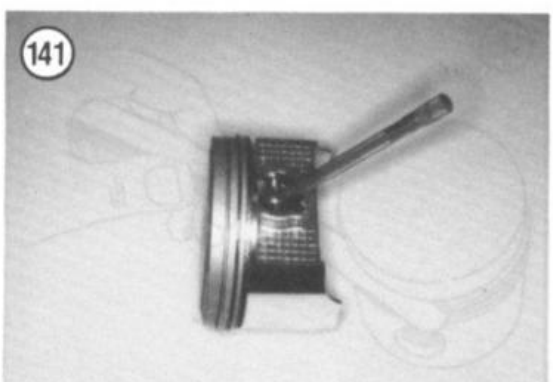
2. Carefully clean the piston as follows:
   a. Clean the carbon from the piston crown (A, **Figure 137**) with a soft scraper or wire wheel.
   b. Be sure to remove all deposits from the valve reliefs (B, **Figure 137**) in the piston crown.
   c. Do not remove or damage the carbon ridge around the circumference of the piston above the top ring (A, **Figure 138**).
   d. If the piston, rings and cylinder are found to be dimensionally correct and can be reused, removal of the carbon ring from the top of the piston or the carbon ridge from the cylinder will promote excessive oil consumption.











CAUTION

*Do not wire brush the sides of the piston as the brush will leave scratches on the ring grooves and piston skirt (**Figure 139**).*

3. After cleaning the piston, examine the crown (A, **Figure 137**). The crown should show no signs of wear or damage. If the crown appears pecked or spongy-looking, also check the spark plug, valves and combustion chamber for aluminum deposits. If these deposits are found, the cylinder is suffering from excessive heat caused by a lean fuel mixture or preignition.

4. Examine each ring groove for burrs, dented edges and wide wear. Pay particular attention to the top compression ring groove, as it usually wears more than the others. Because the oil rings are constantly bathed in oil, these rings and grooves wear little compared to compression rings and their grooves. If there is evidence of oil ring groove wear or if the oil ring assembly is tight and difficult to remove, the piston skirt may have collapsed due to excessive heat and is permanently deformed. Replace the piston.

5. Check the oil control holes (**Figure 140**) in the piston for carbon or oil sludge buildup. Clean the holes with a small diameter drill bit of the correct size then flush out with solvent and dry with compressed air.

6. Check the piston skirt (**Figure 139**) for cracks or other damage. If a piston shows signs of partial seizure (bits of aluminum build-up on the piston skirt), the piston should be replaced and the cylinder bored (if necessary) to reduce the possibility of engine noise and further piston seizure.

NOTE

If the piston skirt is worn or scuffed unevenly from side to side, the connecting rod may be bent or twisted.

7. Inspect the piston pin for chrome flaking or cracks. Replace if necessary. Suzuki does not provide specifications for the outer diameter of the piston pin.

8. Oil the piston pin and install it in the piston (**Figure 134**). Slowly rotate the piston pin and check for radial play. If any radial play exists, the piston pin and piston should be replaced as a set.

9. Measure the inside diameter of the piston pin bore with a snap gauge (**Figure 141**), then measure the snap gauge with a micrometer (**Figure 142**). Meas-

ure the outside diameter of the piston pin with a micrometer (**Figure 143**). Compare with dimensions listed in **Table 2**. Replace the piston and pin as a set if either or both are worn.

10. Install a new piston pin circlip in each piston circlip groove (B, **Figure 138**) and check the groove for wear or circlip looseness by pulling the circlip from side to side. If the circlip has any side play, the groove is worn and the piston must be replaced.

11. Measure piston-to-cylinder clearance as described under *Piston Clearance* in this chapter.

12. If damage or wear indicate piston replacement, select a new piston as described under *Piston Clearance* in this chapter.

Piston Clearance

1. Make sure the piston and cylinder walls are clean and dry.

2. Measure the cylinder bore with a bore gauge or inside micrometer. Then measure the bore gauge with a micrometer to determine the bore diameter. Measure the cylinder bore at the points shown in **Figure 127**. Measure in 2 axes—in line with the piston pin and at 90° to the pin.

NOTE

When measuring the piston diameter in Step 3, measure the piston diameter at a point 15 mm (0.6 in.) from the lower edge of the piston skirt.

3. Measure the piston diameter with a micrometer (**Figure 144**) at a right angle to the piston pin bore.

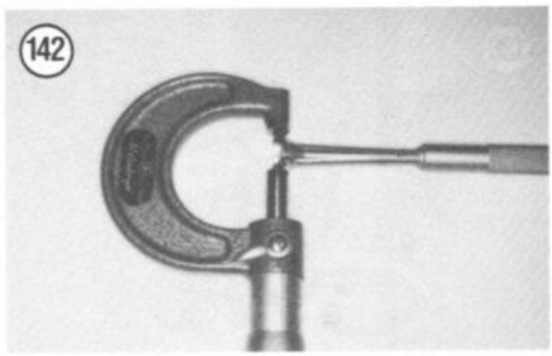
4. Subtract the piston diameter from the largest bore diameter; the difference is piston-to-cylinder clearance.

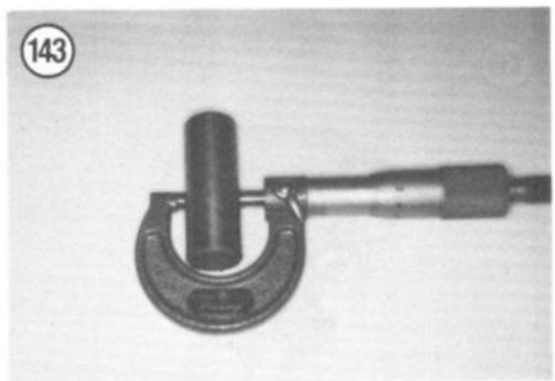
5. If clearance exceeds specifications, the piston should be replaced and the cylinder bored oversize. Purchase the new piston first. Measure its diameter and add the specified clearance to determine the proper cylinder bore diameter.

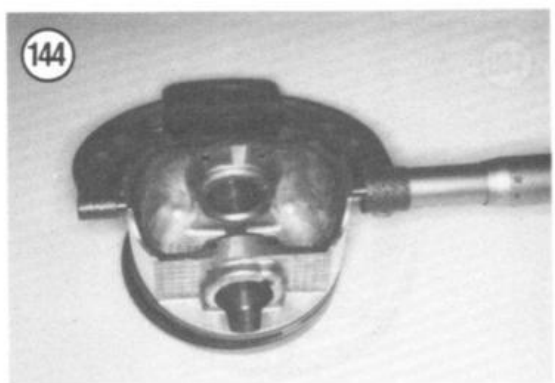
PISTON RINGS

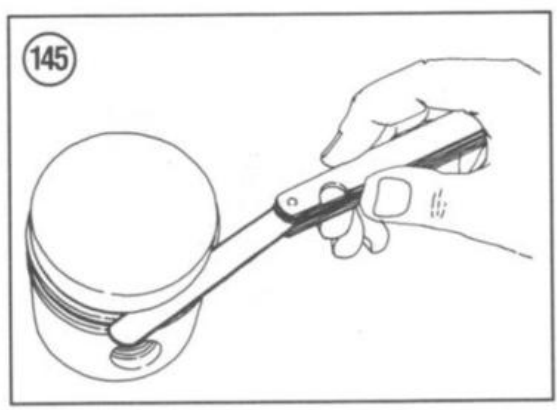
Inspection/Removal/Installation

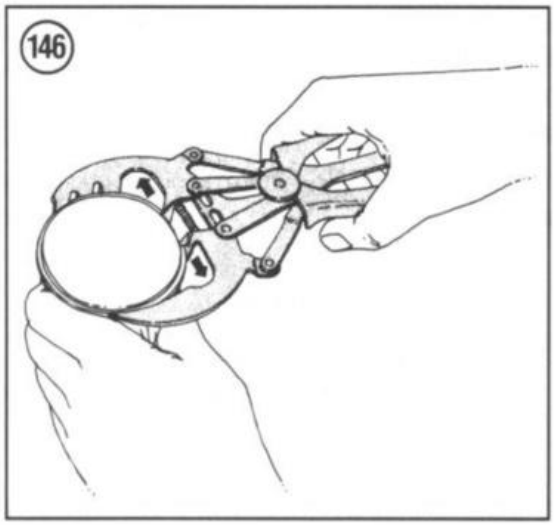
1. Measure the side clearance of each ring in its groove with a flat feeler gauge (**Figure 145**) and compare with the specifications in **Table 2**. If the clearance is greater than specified, the rings must be

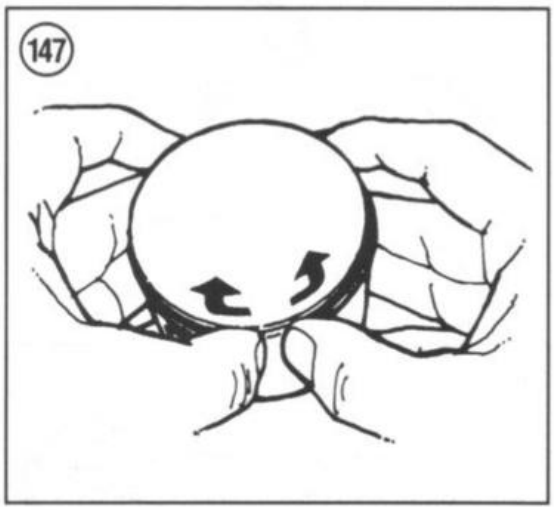


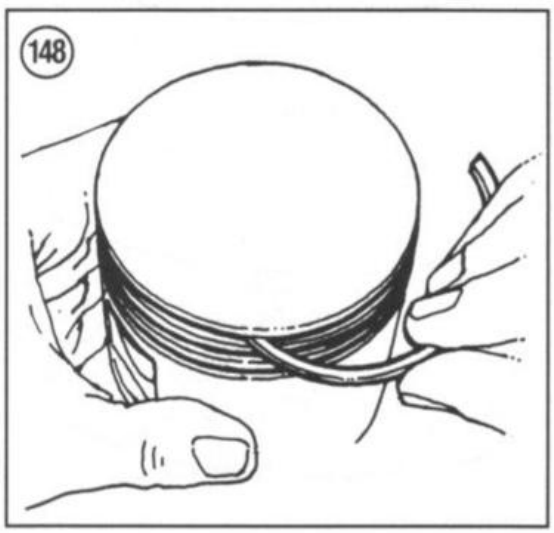












replaced. If the clearance is still excessive with the new rings, the piston must be replaced.

WARNING

The edges of all piston rings are very sharp. Be careful when handling them to avoid cutting fingers.

NOTE

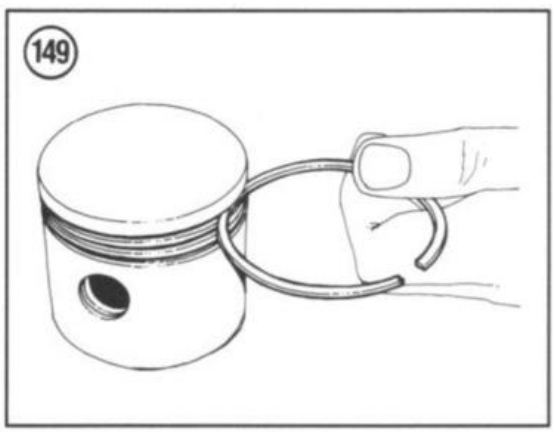
Store the rings in order of removal.

2. Remove the old rings with a ring expander tool (**Figure 146**) or by spreading the ring ends with your thumbs and lifting the rings up evenly (**Figure 147**).
3. Using a broken piston ring, remove all carbon from the piston ring grooves (**Figure 148**).
4. Inspect grooves carefully for burrs, nicks or broken or cracked lands. Replace piston if necessary.
5. Check end gap of each ring. To check, insert the ring into the top of the cylinder bore approximately 20 mm (25/32 in.) and square it with the cylinder wall by tapping it with the piston.
6. Measure the end gap with a feeler gauge. Compare gap with **Table 2**. Replace ring if gap is too large. If the gap on the new ring is smaller than specified, hold a small file in a vise, grip the ends of the ring with your fingers and enlarge the gap.
7. Roll each ring around its piston groove as shown in **Figure 149** to check for binding. Minor binding may be cleaned up with a fine-cut file.

NOTE

Install all rings with the manufacturer's markings facing up.

8. Install the piston rings—first the bottom, then the middle, then the top ring—by carefully spreading the ends with your thumbs and slipping the rings



over the top of the piston. Remember that the piston rings must be installed with the marks on them facing up toward the top of the piston or there is the possibility of oil pumping past the rings.

9. Install the oil ring assembly into the bottom ring groove. The assembly is comprised of 2 steel rails and 1 expander. Install the expander first (A, **Figure 150**) then install both steel side rails (B, **Figure 150**) on each side of the expander.

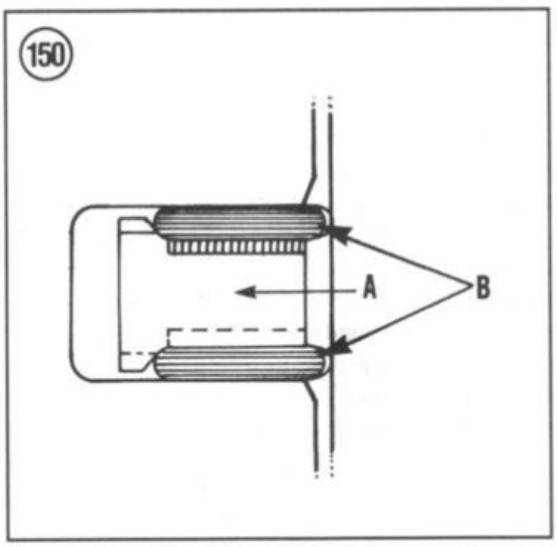
10. The top and middle piston rings are different. The middle ring is slightly tapered and must be installed in the middle groove, it is marked with a "RN" (**Figure 151**). The top ring's outer surface has a slight radius and must be installed in the top groove, it is marked with a "R" (**Figure 152**).

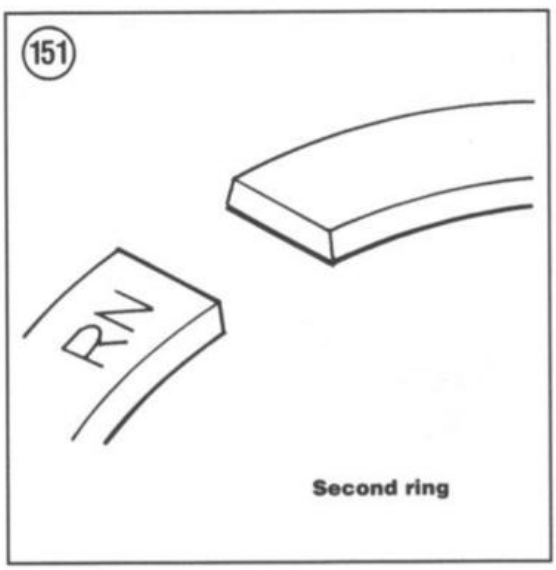
11. Make sure the rings are seated completely in their grooves all the way around the piston.

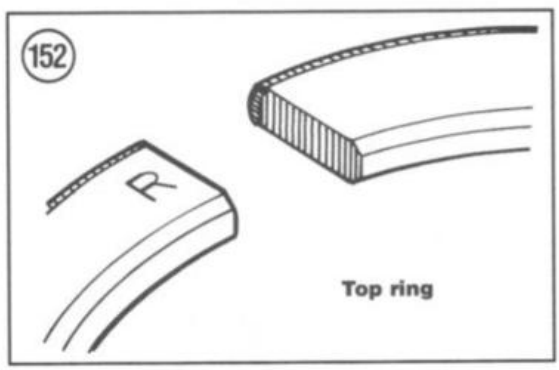
12. Apply clean engine oil to the piston rings and grooves.

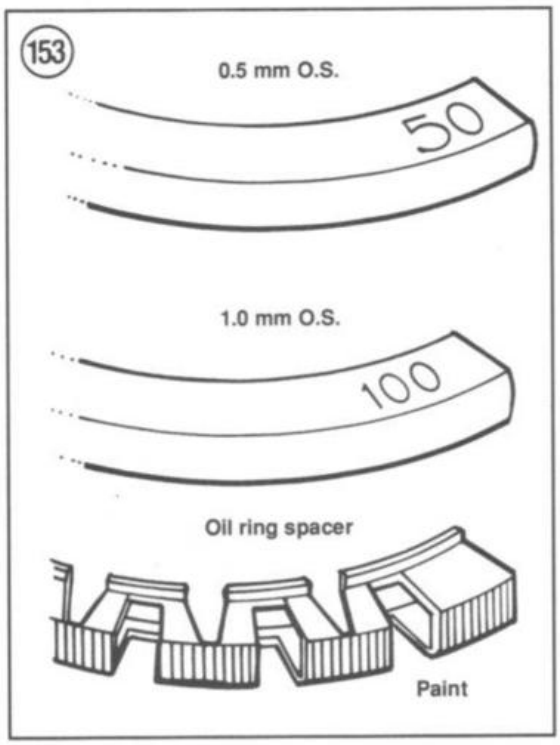
WARNING

The edges of all piston rings are very sharp. Wear cotton gloves or use a shop rag in the next step. Be careful when handling the rings to avoid cutting fingers.









13. Carefully and slowly rotate each piston ring around in its groove in the piston. Make sure the ring rotates freely with no binding or dragging. The ring must be free and move easily so that when the engine is running each ring can rotate in its groove freely.

14. Position the ring ends at 120° apart from each other around the piston. The important thing is that the ring gaps are not aligned with each other when installed to prevent compression pressure from escaping past them on the initial start up.

15. If installing oversize compression rings, check the number to make sure the correct rings are being installed. The ring numbers should be the same as the piston oversize number, or with a different paint color on the oil ring (**Figure 153**).

16. If new rings are installed, the cylinder must be deglazed or honed. This will help to seat the new rings. If necessary, refer honing service to a Suzuki dealer or motorcycle repair shop. After honing, measure the end gap of each ring and compare to dimensions in **Table 2**.

NOTE

If the cylinder was deglazed or honed, clean the cylinder bore as described under ***Cylinder Block Inspection*** *in this chapter.*

17. Follow the *Break-in Procedure* in Chapter Five if new pistons or new piston rings have been installed.

Table 1 GENERAL ENGINE SPECIFICATIONS

DR250 and DR250S	
Engine type	4-stroke, SOHC, 4-valve, single cylinder
Bore × stroke	73.0 × 59.6 mm (2.874 × 2.346 in.)
Compression ratio	10:1
Displacement	249 cc (15.2 cu. in.)
Lubrication system	Dry sump
DR350 and DR350S	
Engine type	4-stroke, SOHC, 4-valve, single cylinder
Bore × stroke	79.0 × 71.2 mm (3.110 × 2.803 in.)
Compression ratio	9.5:1
Displacement	349 cc (21.3 cu. in.)
Lubrication system	Dry sump

Table 2 ENGINE TOP END SERVICE SPECIFICATIONS

Item	Specifications mm (in.)	Wear limit mm (in.)
Rocker arm bore ID	12.000-12.018 (0.4724-0.4731)	—
Rocker arm shaft OD	11.973-11.984 (0.4714-0.4718)	—

(continued)

Table 2 ENGINE TOP END SERVICE SPECIFICATIONS (continued)

Item	Specifications mm (in.)	Wear limit mm (in.)
Camshaft		
Lobe (250 cc)		
Intake		
Height	33.458-33.518 (1.3172-1.3196)	33.16 (1.3055)
Exhaust		
Height	33.455-33.515 (1.3171-1.3195)	33.16 (1.3055)
Lobe (350 cc)		
Intake		
Height	33.430-33.470 (1.3161-1.3177)	33.13 (1.3043)
Exhaust		
Height	33.460-33.500 (1.3173-1.3189)	33.16 (1.3055)
Bearing journal OD		
Right-hand	21.959-21.980 (0.8645-0.8654)	—
Left-hand	17.466-17.484 (0.6876-0.6883)	—
Bearing oil clearance		
Right-hand	0.032-0.066 (0.0013-0.0026)	0.150 (0.0059)
Left-hand	0.028-0.059 (0.0011-0.0023)	0.150 (0.0059)
Runout limit	—	0.10 (0.004)
Cylinder head		
Warp limit	—	0.05 (0.002)
Cylinder		
250 cc		
Bore	73.000-73.015 (2.8740-2.8746)	73.090 (2.8776)
350 cc		
Bore	79.000-79.015 (3.1102-3.1108)	79.075 (3.1132)
Distortion	—	0.05 (0.002)
Piston (250 cc)		
Diameter	72.955-72.970 (2.8722-2.8728)	72.880 (2.8693)
Piston-to-cylinder clearance	0.040-0.050 (0.0016-0.0020)	0.120 (0.0047)
Piston pin bore	19.002-19.008 (0.7481-0.7483)	19.030 (0.7492)
Piston pin ID	18.996-19.000 (0.7479-0.7480)	18.980 (0.7472)
Piston (350 cc)		
Diameter	78.940-78.955 (3.1102-3.1108)	79.075 (3.1132)
Piston-to-cylinder clearance	0.055-0.065 (0.0022-0.0026)	0.120 (0.0047)
Piston pin bore	20.002-20.008 (0.7875-0.7877)	20.030 (0.7886)

(continued)

Table 2 ENGINE TOP END SERVICE SPECIFICATIONS (continued)

Item	Specifications mm (in.)	Wear limit mm (in.)
Piston pin ID	19.996-20.000 (0.7872-0.7874)	19.980 (0.7866)
Piston rings		
End gap		
250 cc		
Top and 2nd	0.10-0.30 (0.004-0.012)	0.70 (0.028)
350 cc		
Top and 2nd	0.15-0.30 (0.006-0.012)	0.70 (0.028)
Side clearance		
Top	—	0.180 (0.007)
2nd	—	0.150 (0.006)
Valve		
Stem runout limit	—	0.05 (0.002)
Valve stem outside diameter		
Intake	4.975-4.990 (0.1959-0.1965)	—
Exhaust	4.955-4.970 (0.1951-0.1957)	—
Head diameter		
250 cc		
Intake	28.3 (1.11)	—
Exhaust	25.0 (0.98)	—
350 cc		
Intake	30.6 (1.20)	—
Exhaust	27.0 (1.06)	—
Seat width	0.9-1.1 (0.035-0.043)	—
Head thickness		
Intake and exhaust	—	0.5 (0.02)
Valve guide inside diameter		
Intake and exhaust	5.000-5.012 (0.1969-0.1973)	—
Valve stem to guide clearance		
Intake	0.010-0.037 (0.0004-0.0015)	0.35 (0.014)
Exhaust	0.030-0.057 (0.0012-0.0022)	0.35 (0.014)
Valve springs		
Inner (all)	—	35.0 (1.38)
Outer (all)	—	37.8 (1.49)
Spring tilt limit		1.7
Inner and outer	—	(0.067)

Table 3 ENGINE TOP END TIGHTENING TORQUES

Item	N•m	ft.-lb.
Cylinder head cover bolts	8-12	6-8.5
Camshaft sprocket bolts*	14-16	10-11.5
Camshaft chain tensioner		
Body mounting bolts	8-13	6-9.5
Center bolt	7-9	5-6.5
Cylinder head		
Bolts	35-40	25.5-29
Nuts	23-27	16.5-19.5
Cylinder base nuts	23-27	16.5-19.5

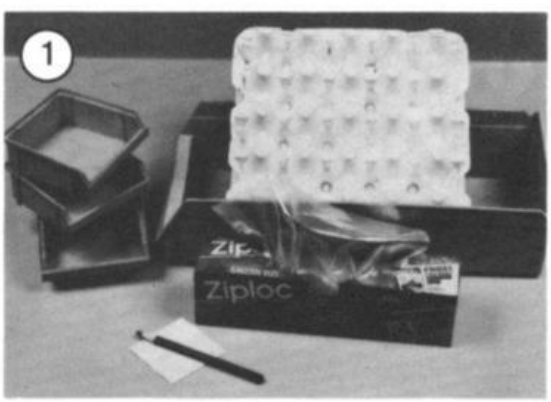
* Apply red Loctite (No. 271) before tightening bolts.

CHAPTER FIVE

ENGINE LOWER END

This chapter describes service procedures for the following lower end components:

a. Crankcases.
b. Crankshaft.
c. Connecting rod.
d. Transmission (removal and installation).
e. Internal shift mechanism (removal and installation).
f. Balancer shaft.
g. Oil pump.
h. Starter reduction gears (models so equipped).



Prior to removing and disassembling the crankcase, clean the entire engine and frame with a good grade commercial degreaser, like Gunk or Bel-Ray engine degreaser or equivalent. It is easier to work on a clean engine and you will do a better job.

Make certain that you have all the necessary tools available, especially any special tool(s), and purchase replacement parts prior to disassembly. Also make sure you have a clean place to work.

One of the more important aspects of engine overhaul is preparation. Improper preparation before and failing to identify and store parts during removal will cause a headache when it comes time to reinstall and assemble the engine. Before removing the first bolt and to prevent frustration during installation, get a number of boxes, plastic bags and containers and store the parts as they are removed (**Figure 1**). Also have on hand a roll of masking tape and a permanent, waterproof marking pen to label each part or assembly as required. If your bike was purchased second hand and it appears that some of the wiring may have been changed or replaced, it will be to your advantage to label each electrical connection before disconnecting it.

Throughout the text there is frequent mention of the right-hand and left-hand side of the engine. This refers to the engine as it sits in the bikes frame, *not* as it sits on your workbench. "Right-" and "left-hand" refer to a rider sitting on the seat facing forward.

Engine lower end service specifications are listed in **Table 1**. **Tables 1-2** are found at the end of the chapter.

SERVICING ENGINE IN FRAME

Some of the components can be serviced while the engine is mounted in the frame (the bike's frame is a great holding fixture—especially for breaking loose stubborn bolts and nuts):

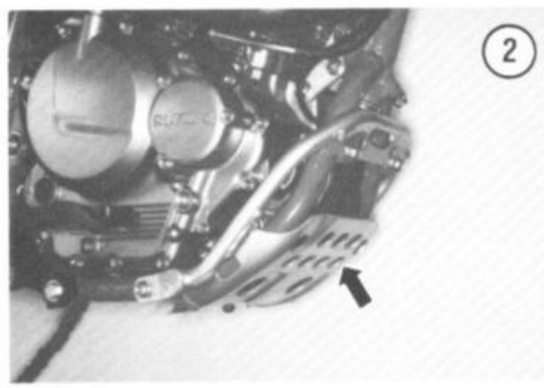
a. External gearshift mechanism (Chapter Six).
b. Clutch (Chapter Six).
c. Carburetor (Chapter Eight).
d. Alternator (Chapter Nine).
e. Starter reduction gears (models so equipped) (this chapter).

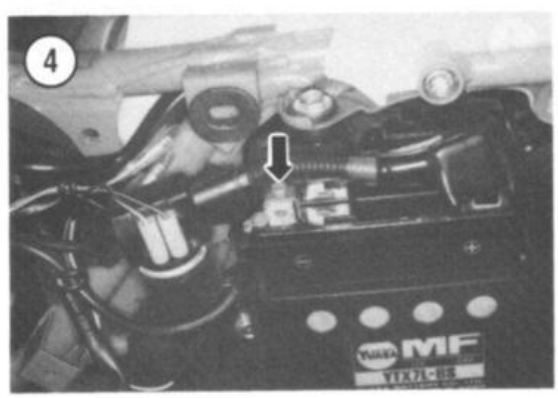
ENGINE

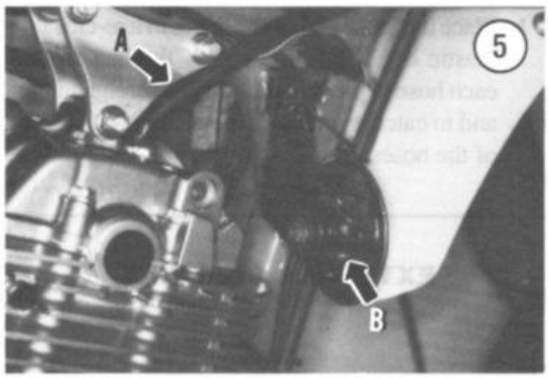
Removal/Installation

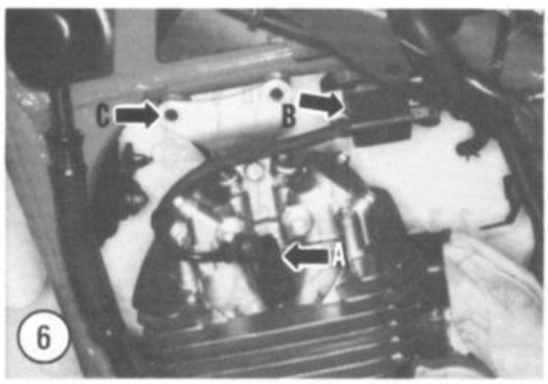
If service work requires only the removal of top end component(s), the engine can remain in the frame. If the engine requires crankcase disassembly the engine must be removed from the frame. It will be easier to remove as many of the sub-assemblies from the exterior of the engine before removing the crankcase from the frame since the frame can be used as a holding fixture as the engine is disassembled. Attempting to disassemble the complete engine on top of a workbench is more time consuming and will require an assistant to help hold the engine while you loosen many of the *very tight* larger nuts and bolts.

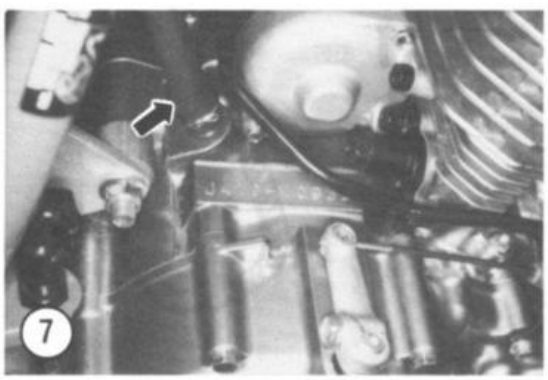
1. Drain the engine oil as described in Chapter Three.
2. Remove the bolts securing the engine skid plate (**Figure 2**) and remove the skid plate.
3. Support the bike on a stand and raise the rear wheel off the ground with a suitable wheel stand.
4. Remove the left- and right-hand side covers (A, **Figure 3**).
5. Remove the seat (B, **Figure 3**) as described in Chapter Thirteen.
6. Disconnect the battery negative (–) electrical terminal connector (**Figure 4**).
7. Remove the fuel tank as described in Chapter Eight.
8. On California models, remove the evaporation emission control assembly as described in Chapter Eight.
9. Remove the exhaust pipe and muffler assembly as described in Chapter Eight.
10. On models so equipped, disconnect the decompression cable as follows:











a. At the cylinder head, loosen the adjuster locknut and turn the adjuster to obtain as much cable slack as possible.

b. Disconnect the cable from the lever and move the cable out of the way.

11. Disconnect the cylinder head cover breather hose (A, **Figure 5**).

12. Remove the horn (B, **Figure 5**) as described in Chapter Nine.

13. Disconnect the spark plug cap (A, **Figure 6**) from the spark plug. Do *not* remove the spark plug.

14. Remove the bolts securing the ignition coil (B, **Figure 6**) and move the coil and spark plug wire and cap out of the way.

15. Disconnect the crankcase breather hose (**Figure 7**) from the crankcase.

16. Remove the pinch bolt securing the shift lever (**Figure 8**) and pull the shift lever off the shaft. If the splined boss is tight on the shaft, spread the slot open with a screwdriver.

17. Remove the drive sprocket as described in Chapter Eleven.

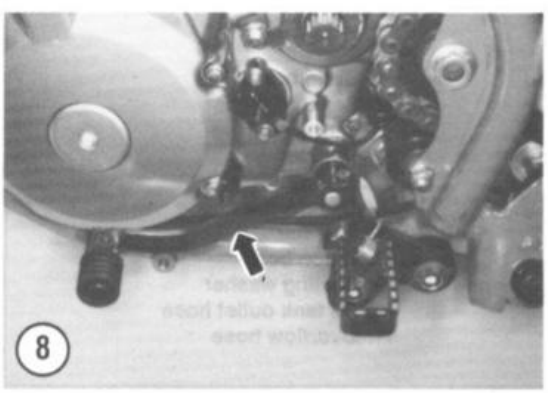
18. Slide back the rubber boot (A, **Figure 9**) on the clutch lever.

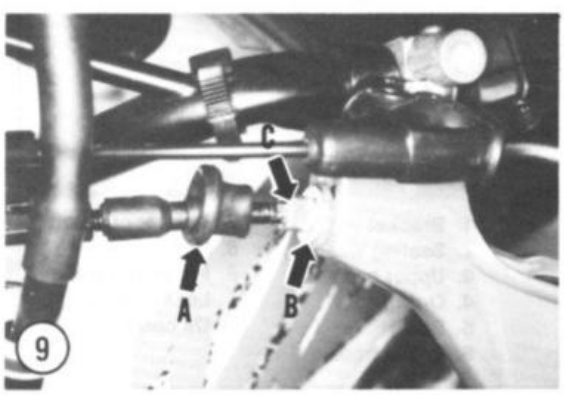
19. Loosen the clutch cable adjuster locknut (B, **Figure 9**) and turn the adjuster (C, **Figure 9**) toward the clutch lever.

20. Disconnect the clutch cable at the release lever at the crankcase (**Figure 10**) and remove the cable from the cable bracket on the clutch cover.

NOTE

If the bike is equipped with the optional oil cooler; refer to ***Figure 11*** *for fitting locations. The oil cooler is not available on models sold in California.*

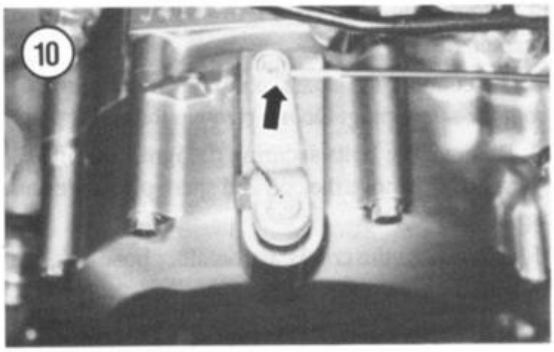




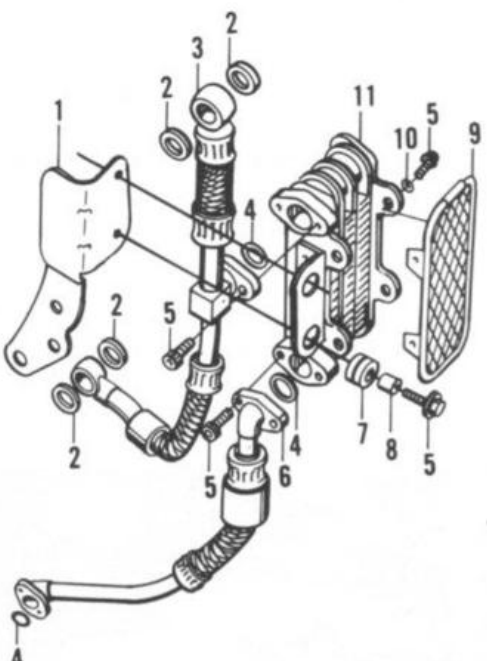
21. Refer to **Figure 12** and disconnect the external oil lines from the engine:

a. Remove the bolts securing the oil hose fittings to the front of the crankcase. Move the hoses (**Figure 13**) out of the way and remove the O-ring from both fittings.

b. Place the loose end of the hoses in a re-closable plastic bag. Close the end of the bag around each hose to prevent the entry of foreign matter and to catch any residual oil that may drain out of the hoses.

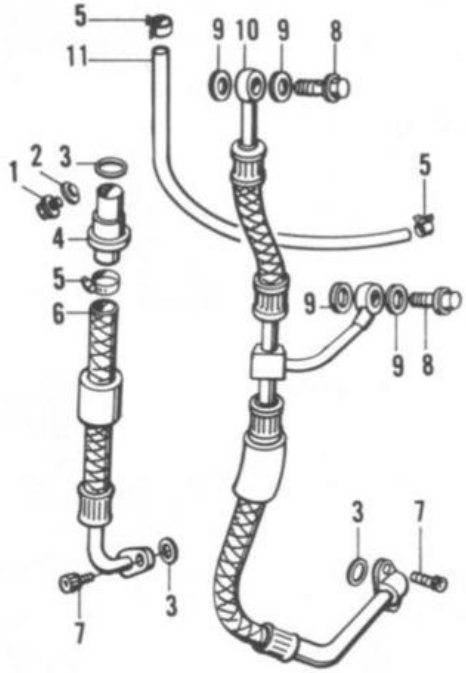


11 OPTIONAL OIL COOLER (EXCEPT CALIFORNIA)

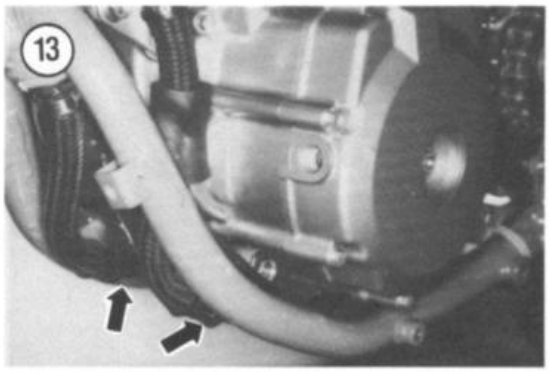


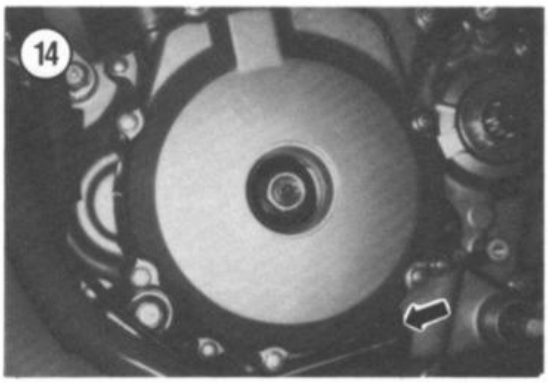
1. Bracket
2. Sealing washer
3. Upper hose
4. O-ring seal
5. Bolt
6. Lower hose
7. Rubber cushion
8. Collar
9. Protective grille
10. Lockwasher
11. Oil cooler

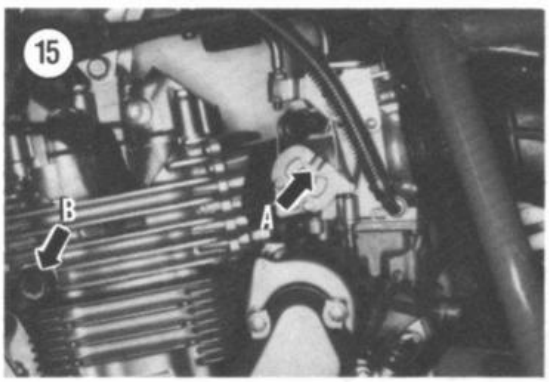
12 EXTERNAL OIL LINES

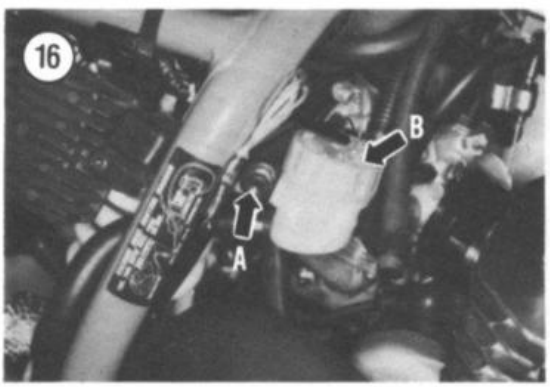


1. Drain bolt
2. Sealing washer
3. O-ring seal
4. Strainer
5. Clamp
6. Oil tank inlet hose
7. Bolt
8. Union bolt
9. Sealing washer
10. Oil tank outlet hose
11. Overflow hose









c. Remove the bolts securing the oil hose (**Figure 14**) to the left-hand side of the crankcase. Move the hose out of the way and remove the O-ring from the fitting.

d. Place the loose end of the hose in a re-closable plastic bag. Close the end of the bag around the hose to prevent the entry of foreign matter and to catch any residual oil that may drain out of the hose.

22. Remove the carburetor (A, **Figure 15**) as described in Chapter Eight.

23. Remove the union bolt and sealing washers (B, **Figure 15**) securing the oil hose to the left-hand side of the cylinder head.

24. Place the loose end of the hose in a re-closable plastic bag. Close the end of the bag around the hose to prevent the entry of foreign matter and to catch any residual oil that may drain out of the hose.

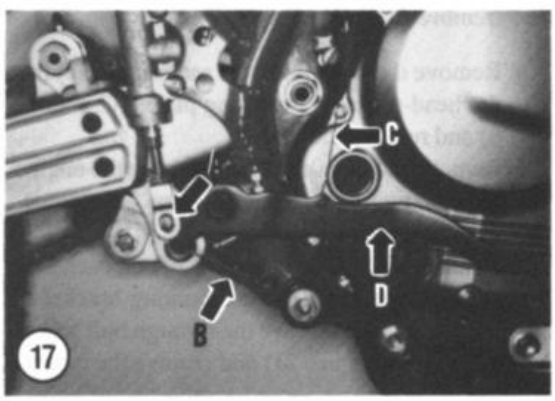
25. Remove the bolt (A, **Figure 16**) securing the rear brake master cylinder reservoir and guard. Move the reservoir (B, **Figure 16**) out of the way and keep it upright to avoid letting air into the reservoir hose. It is not necessary to disconnect the hydraulic hose. Reinstall the guard and bolt onto the frame to avoid misplacing them.

26. To move the brake pedal down out of the way, perform the following:

a. Remove cotter pin, slide out the pivot pin (A, **Figure 17**) and disconnect the master cylinder push rod from the brake pedal.

b. Unhook the brake pedal return spring (B, **Figure 17**) and brake light switch spring (C, **Figure 17**) from the brake pedal arm.

c. Pivot the brake pedal (D, **Figure 17**) out of the way. It is not necessary to remove the brake pedal.



27. Disconnect the following electrical connectors:
    a. Engine ground cable (**Figure 18**).
    b. Alternator connectors.
    c. On models so equipped, the electrical connector from starter motor (**Figure 19**).
    d. Disconnect the electrical wire clamp(s) from the wires and route the wire harness away from the frame.
28. If the engine requires disassembly, remove the following sub-assemblies:
    a. External gearshift mechanism (Chapter Six).
    b. Clutch (Chapter Six).
    c. Alternator (Chapter Nine).
    d. Starter reduction gears (models so equipped) (this chapter).
    e. Kickstarter gears (Chapter Six).
29. Remove the engine assembly from the frame as follows:
    a. Place a hydraulic jack underneath the engine. Raise the jack so that the pad just rests against the bottom of the engine. Place a block of wood on the jack pad to protect the engine case. If you do not have access to a jack, place wood blocks underneath the engine. The idea is to have a support available when the engine mounting bolts are loosened and then removed.

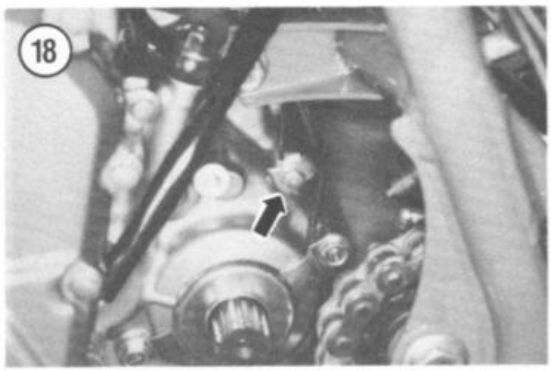
NOTE

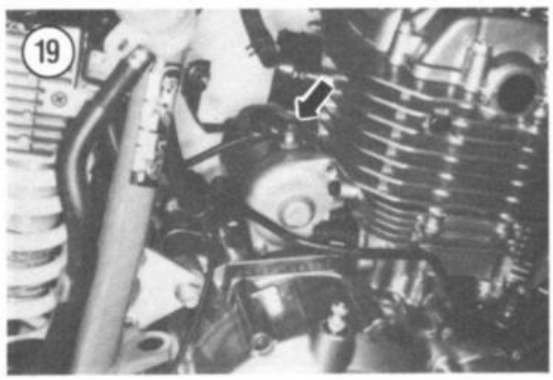
Due to the different length bolts used on the mounting hardware, it is suggested that the bolts and nuts be reinstalled into their correct hole in each respective mounting plates. This will save time during installation.

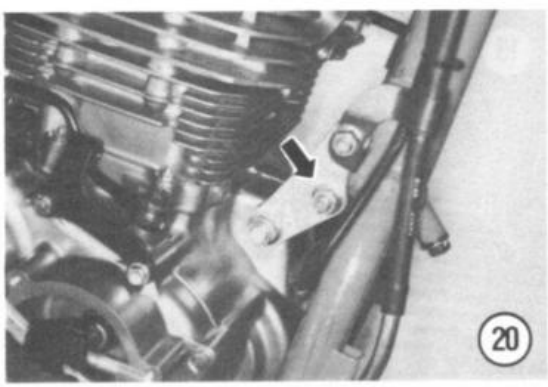
NOTE

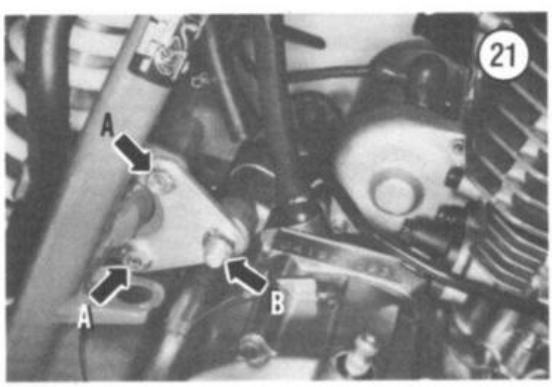
On California models, 2 of the bolts have already been removed when the evaporation emission control unit was removed.

    b. Remove the bolts and nuts securing the cylinder head-to-frame mounting plates (C, **Figure 6**) and remove the plates.
    c. Remove the bolts and nuts securing the engine front mounting bracket (**Figure 20**) and remove the mounting plates.
    d. Remove the bolts (A, **Figure 21**) on each side securing the engine rear mounting bracket to the frame, then remove the through bolt spacer and nut (B, **Figure 21**) and remove the mounting plates.









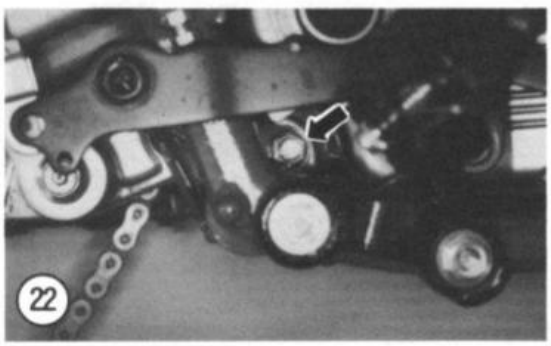
e. Remove the lower rear through bolt and nut (**Figure 22**).
f. Remove the lower front through bolt, spacers and nut (**Figure 23**).
g. Lift the engine (**Figure 24**) out of the right-hand side of the frame.

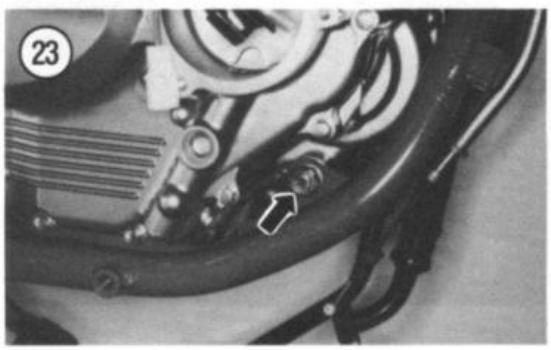
30. While the engine is removed, check the engine frame mounts for cracks or other damage.

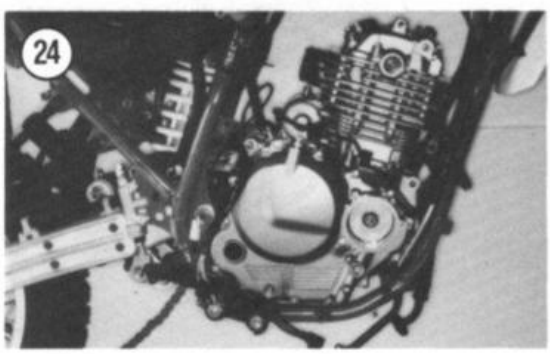
31. Install by reversing these removal steps while noting the following:
a. Install all engine mounting bolts from the left-hand side.
b. Tighten the engine mounting bolts and nuts to the torque specifications in **Table 2**.
c. To prevent oil leakage, install *new* O-ring seals on all oil hose fittings.
d. Refill the engine oil as described in Chapter Three.

32. Adjust the following as described in Chapter Three:
a. Decompression cable (models so equipped).
b. Clutch cable.
c. Drive chain.
d. Rear brake pedal height.
e. Rear brake light.

33. Start the engine and check for leaks.





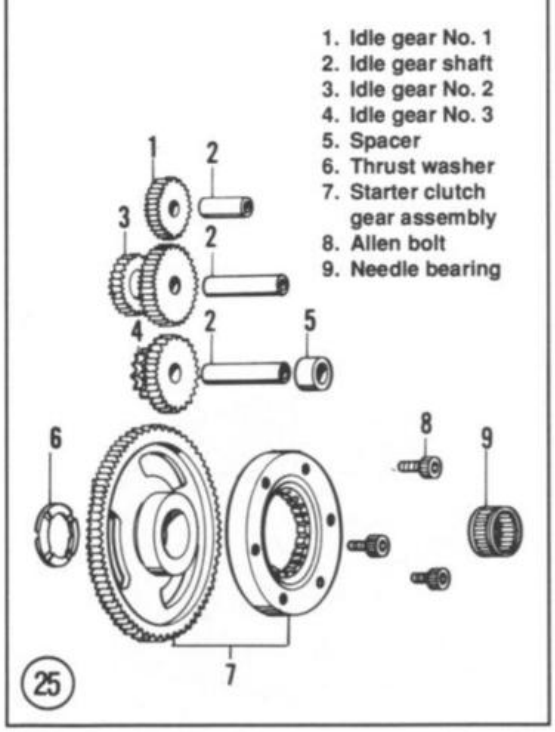


STARTER CLUTCH AND REDUCTION GEARS (ELECTRIC START MODELS)

Starter Clutch Removal/Installation

Refer to **Figure 25** for this procedure.

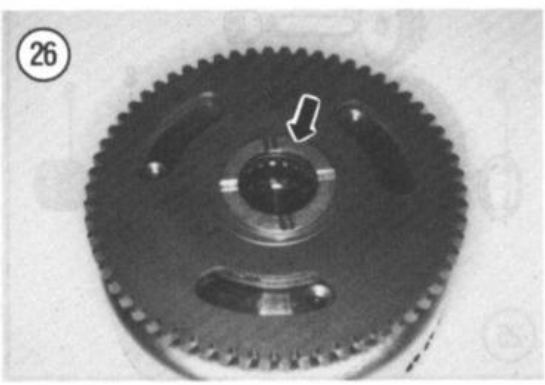
STARTER REDUCTION GEARS

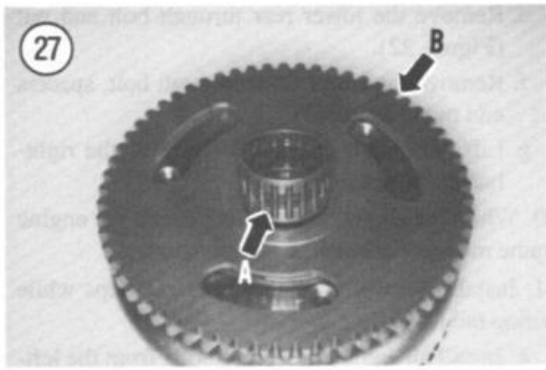


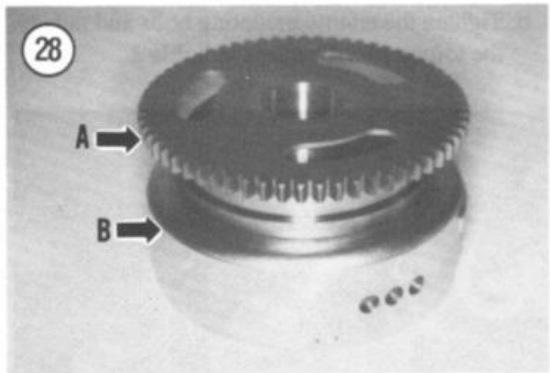
1. Remove the alternator rotor assembly as described in Chapter Nine.
2. If still stuck to the starter driven gear, remove the thrust washer (**Figure 26**).
3. Remove the needle bearing (A, **Figure 27**) from the starter driven gear.
4. Looking straight at the starter driven gear, rotate the starter driven gear (B, **Figure 27**) *clockwise* and pull up at the same time, then remove the gear from the alternator rotor assembly.
5. Install by reversing these removal steps. Looking straight at the starter driven gear, rotate the starter driven gear *clockwise* (A, **Figure 28**) and push it down into the starter clutch assembly (B, **Figure 28**).

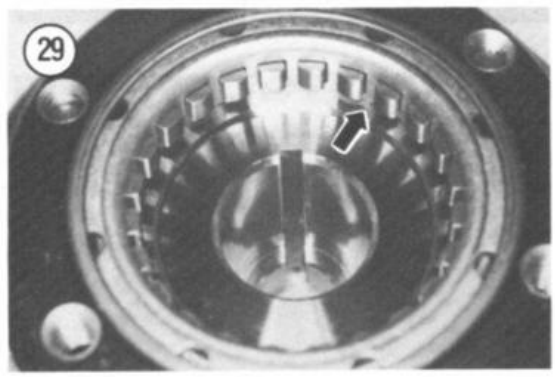
Starter Clutch Inspection

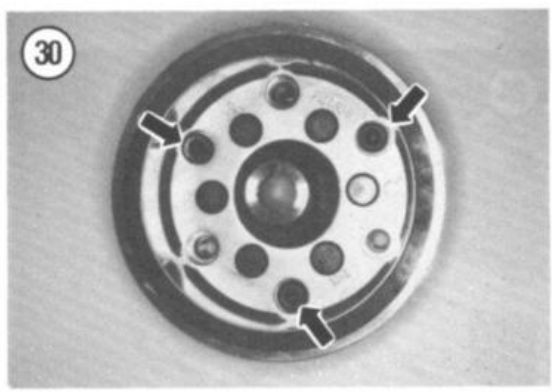
1. Inspect the one-way clutch (**Figure 29**) on the backside of the rotor for wear or damage. If any of the sprags are damaged or missing, replace the clutch.
2. To replace the one-way clutch, perform the following:
   a. Use a center punch and make a mark indicating the correct side up.
   b. Use an impact driver and a 6 mm Allen wrench and remove the bolts (**Figure 30**) securing the one-way clutch housing to the rotor.
   c. Turn the rotor over.
   d. Note the direction of the sprags in the one-way clutch. It must be installed in the same direction.
   e. Remove the one-way clutch (**Figure 31**).
   f. Install the one-way clutch. Refer to the mark made in Step 2a.

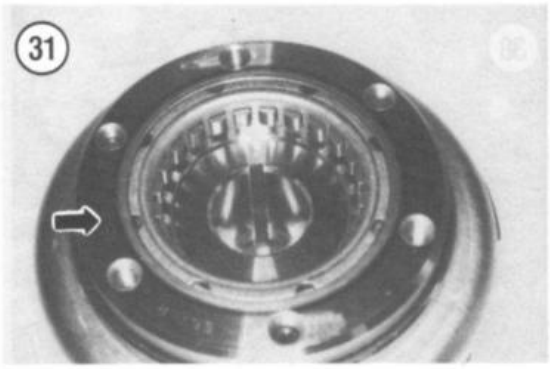


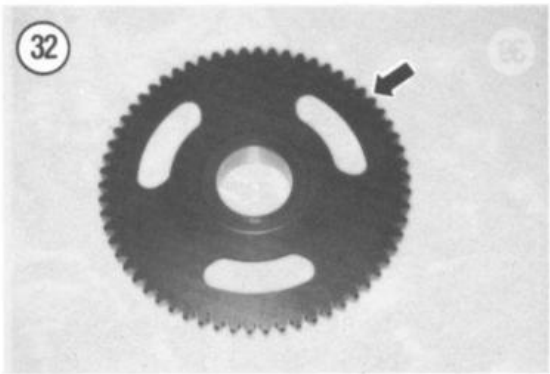


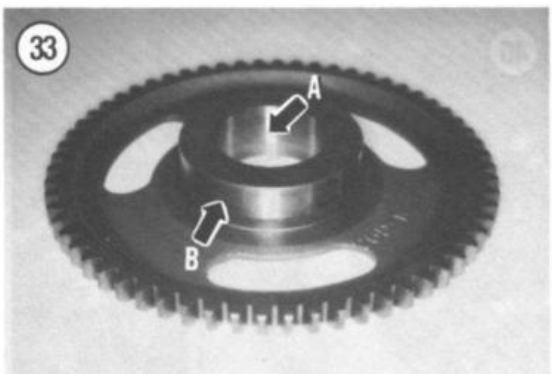


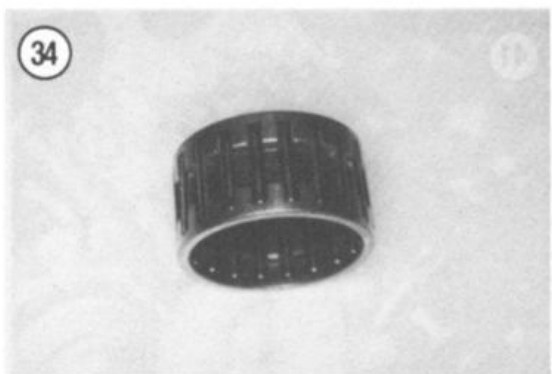












g. To make sure the one-way clutch is installed correctly; temporarily install 2 Allen bolts then install the starter driven gear. Looking directly at the starter driven gear, the gear must be able to rotate only *clockwise*. If the starter gear rotates *counterclockwise*, the one-way clutch is installed backwards or is faulty. Remove the one-way clutch and turn it over. Reinstall the starter driven gear and check for proper rotation. Remove the 2 Allen bolts.

h. Apply red Loctite (No. 271) to the threads of the Allen bolts.

i. Install the Allen bolts (**Figure 30**) and tighten to the torque specification listed in **Table 2**.

3. Inspect the gear teeth (**Figure 32**) on the starter driven gear for chipped or missing teeth. Replace the starter driven gear if necessary.

4. Inspect the needle bearing riding surface (A, **Figure 33**) and the one-way clutch riding surface (B, **Figure 33**) of the starter driven gear for wear or damage. Replace the starter driven gear if necessary.

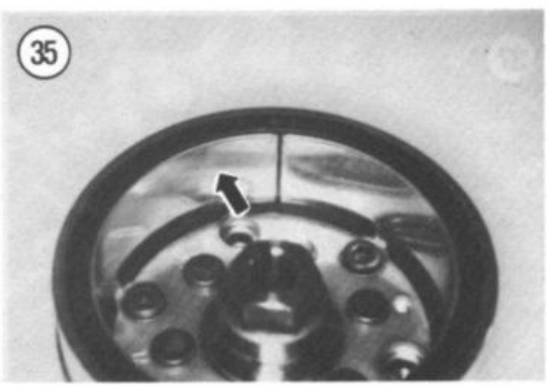
5. Inspect the rows of needles (**Figure 34**) in the needle bearing. The needles must rotate freely with no binding. Replace the needle bearing if necessary.

6. If the one-way clutch was removed or replaced, inspect the inner surfaces of the rotor (**Figure 35**) for any metal particles that may have been picked up by the magnets while removing and installing the Allen bolts. Clean off all metal particles or residue prior to installing the rotor assembly.

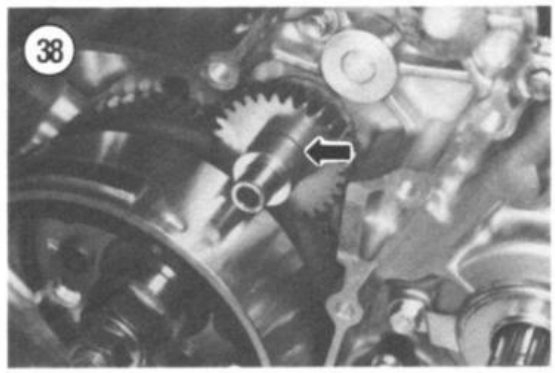
7. For electrical inspection of the alternator rotor and stator and the pulse generator; refer to Chapter Eight.

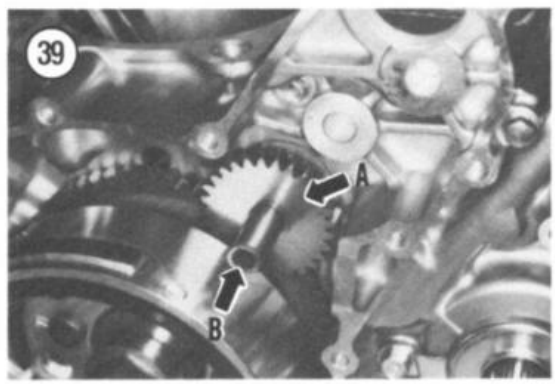
Reduction Gears
Removal/Installation

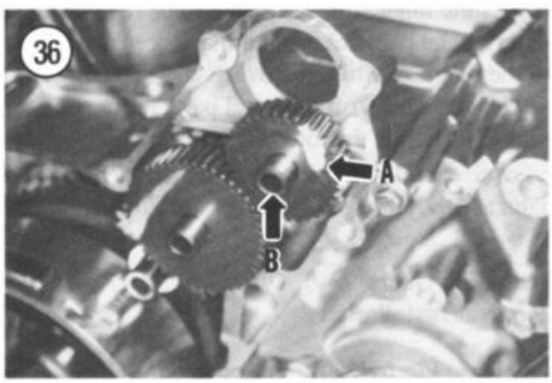
Refer to **Figure 25** for this procedure.

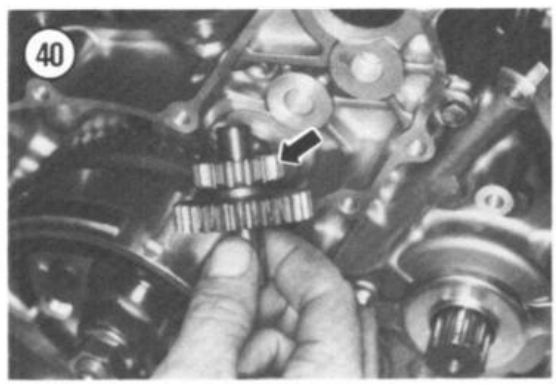


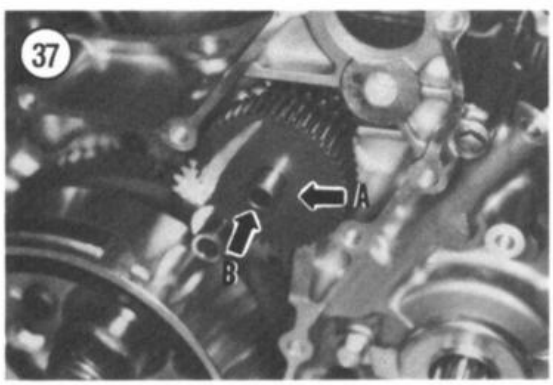
1. Remove the alternator stator assembly as described in Chapter Nine.
2. Withdraw the starter idle gear No. 1 (A, **Figure 36**) and shaft (B, **Figure 36**).
3. Withdraw the starter idle gear No. 2 (A, **Figure 37**) and shaft (B, **Figure 37**).
4. Slide the spacer (**Figure 38**) off the No. 3 idle gear shaft.
5. Withdraw the starter idle gear No. 3 (A, **Figure 39**) and shaft (B, **Figure 39**).
6. Inspect all gears and shafts as described in this chapter.
7. Apply clean engine oil to all rotating surfaces.
8. Install the shaft into the starter idle gear No. 3. Position the gear with the smaller gear end going in first (**Figure 40**) and install the starter idle gear No. 3 and shaft into the crankcase. Push the shaft (B, **Figure 39**) all the way in until it stops.
9. Slide the spacer (**Figure 38**) onto the No. 3 idle gear shaft.
10. Install the shaft into the starter idle gear No. 2. Position the gear with the smaller gear end going in first (**Figure 41**) and install the starter idle gear No.

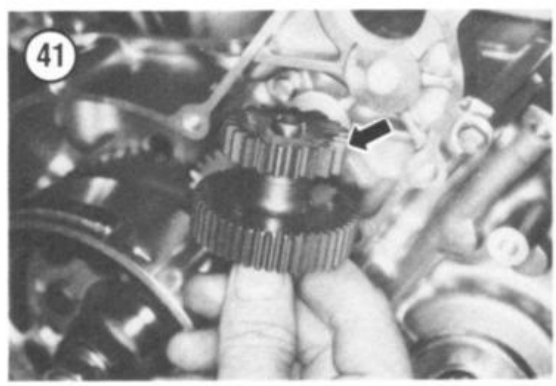












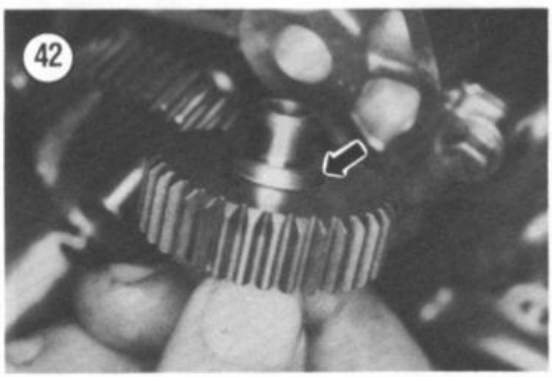
2 and shaft into the crankcase. Push the shaft (B, **Figure 37**) all the way in until it stops.

11. Install the shaft into the starter idle gear No. 1. Position the gear with the raised shoulder going in first (**Figure 42**) and install the starter idle gear No. 1 and shaft into the crankcase. Push the shaft (B, **Figure 36**) all the way in until it stops.

Inspection

Suzuki does not provide any service specifications for the idle gears or shafts. If the gears slightly wobble on the shaft or do not rotate smoothly on its respective shaft, replace the worn part(s).

1. Inspect for chipped or missing teeth on all 3 idle gears. If any of the gears are damaged, replace the gear(s). Check the mating gear for damaged teeth and replace that gear if necessary.



2. Inspect all 3 shafts for wear or damage. Make sure each shaft rotates smoothly within its respective idle gear. Replace if necessary.

OIL PUMP

There are two oil pumps used on the DR series engine. The No. 1 oil pump is attached to the outer surface of the right-hand crankcase cover and is inter-connected to the No. 2 oil pump attached to the inner surface of the right-hand crankcase cover. The inner oil pump, No. 2 *must be removed* prior to removing the outer oil pump, No. 1, therefore the crankcase must be disassembled to service both oil pump assemblies.

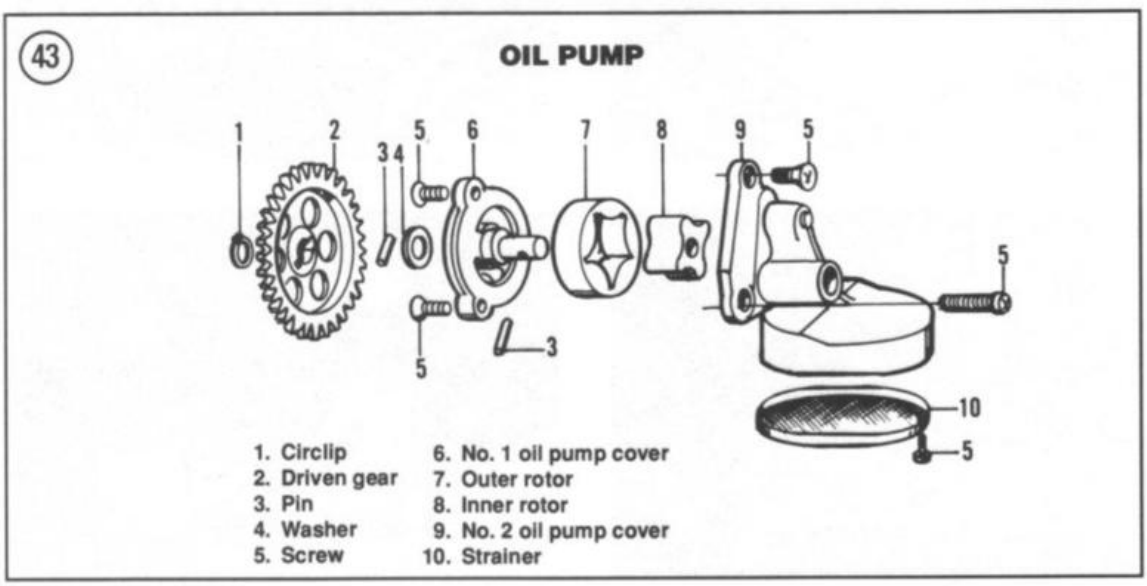
CAUTION

*Do **not** try to remove the outer No. 1 oil pump without first removing the inner No. 2 oil pump. Both pumps will be damaged if not done correctly.*

Suzuki does not provide any service specifications for either oil pump assembly components. If any component is worn or damaged, replace that component or replace either or both oil pump assemblies.

Removal/Disassembly

Refer to **Figure 43** for this procedure.

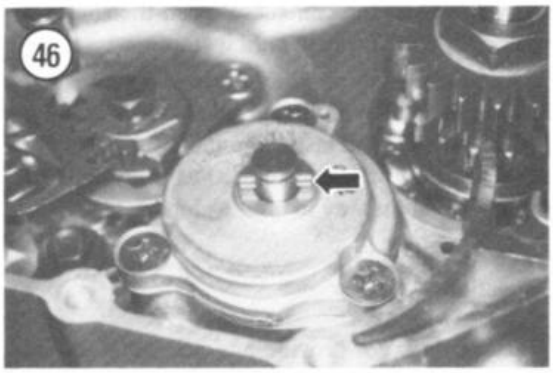


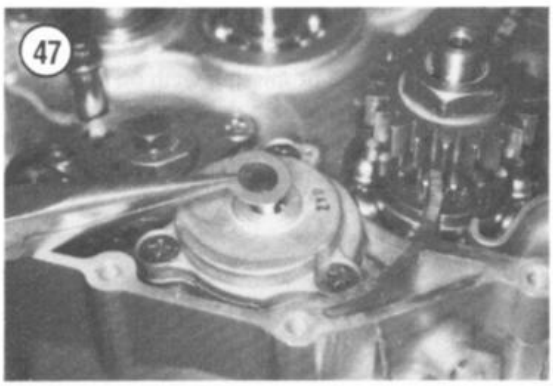
1. Remove the engine from the frame as described in this chapter.
2. Remove the circlip (**Figure 44**) securing the oil pump driven gear and remove the gear (**Figure 45**).
3. Remove the dowel pin (**Figure 46**) and washer (**Figure 47**) from the oil pump drive shaft. Place the dowel pin and drive gear into a reclosable plastic bag to avoid misplacing them.
4. Separate the crankcase as described in this chapter.

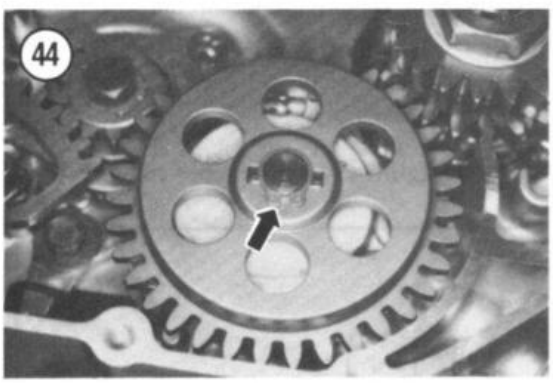
CAUTION

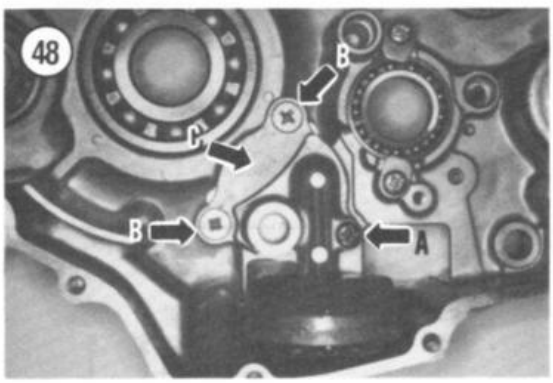
The location of the Phillips head screws is critical for clearance of other components within the crankcase. Be sure to install the countersunk Phillips head screws in the correct location during assembly to avoid component damage.

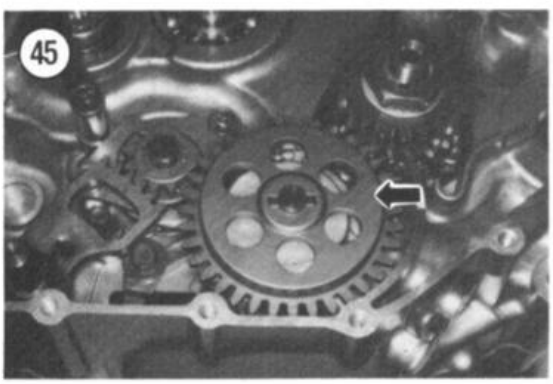
5. Remove the single round head Phillips head screw (A, **Figure 48**) and the 2 countersunk Phillips head screws (B, **Figure 48**) securing the No. 2 oil pump cover assembly to the inner surface of the crankcase.
6. Remove the No. 2 oil pump cover (C, **Figure 48**) assembly from the crankcase.

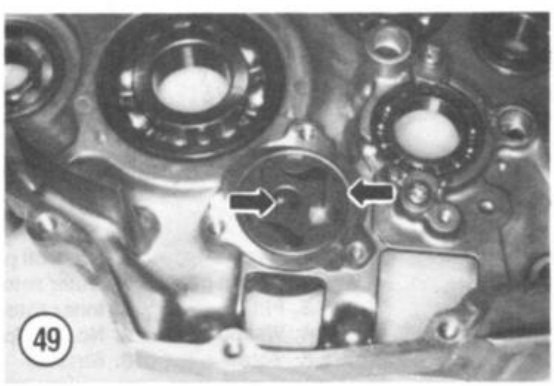


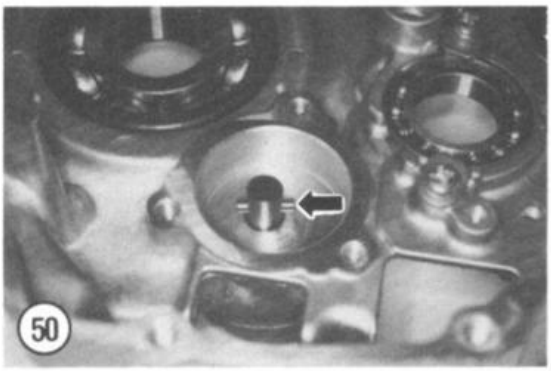






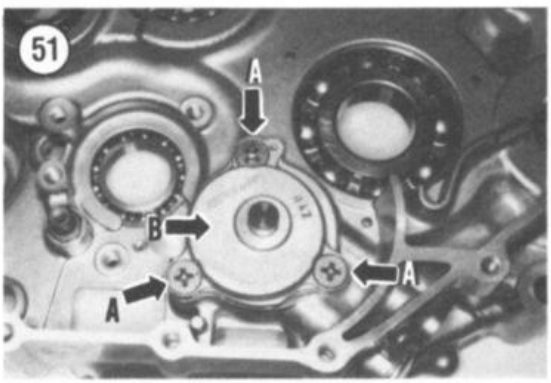




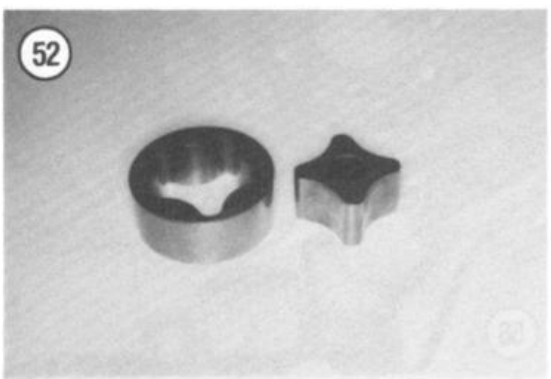


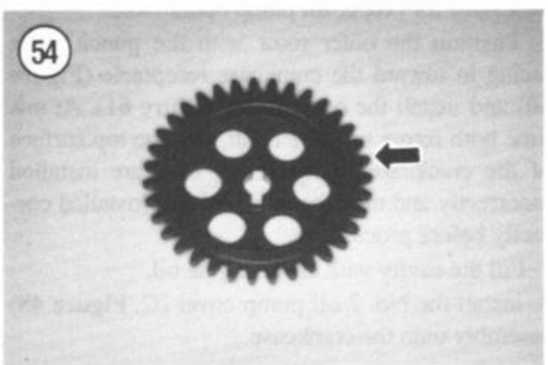
7. Remove the inner and outer rotors (**Figure 49**) from the receptacle in the crankcase.
8. Remove the dowel pin (**Figure 50**) from the No. 1 oil pump drive shaft.
9. Turn the crankcase over and remove the screws (A, **Figure 51**) securing the No. 1 oil pump. Remove the oil pump assembly (B, **Figure 51**).
10. Inspect both oil pump assemblies as described in this chapter.

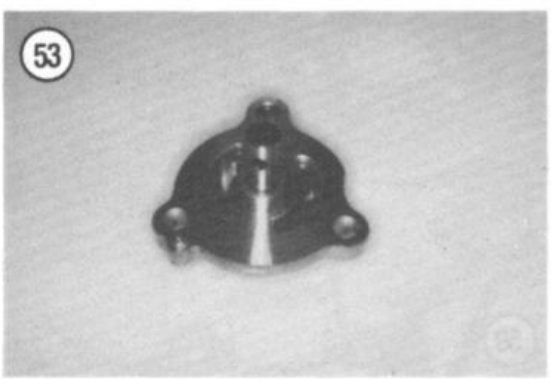
Inspection

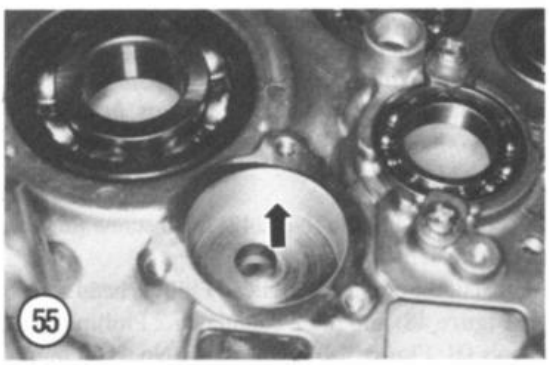


1. Clean all parts in solvent and dry thoroughly.
2. Inspect the inner and outer rotors for scoring, cracks or other damage (**Figure 52**). Check the inner rotor pin slot for damage.
3. Check the No. 1 oil pump assembly (**Figure 53**) for cracks or other damage. Check that the drive shaft rotates freely with no binding. Replace the assembly if necessary.
4. Check the driven gear (**Figure 54**) for chipped or missing teeth or other damage. Replace if necessary.
5. Inspect the No. 2 oil pump rotor receptacle (**Figure 55**) in the inner surface of the crankcase for wear, abrasion or damage.

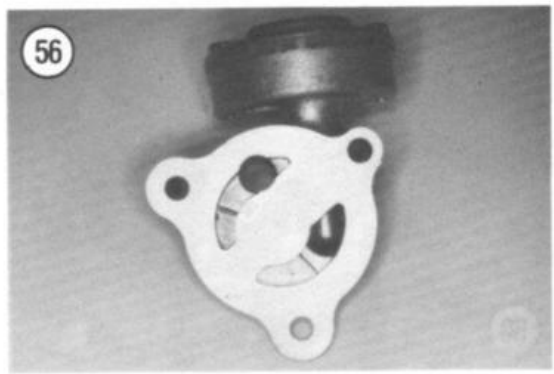


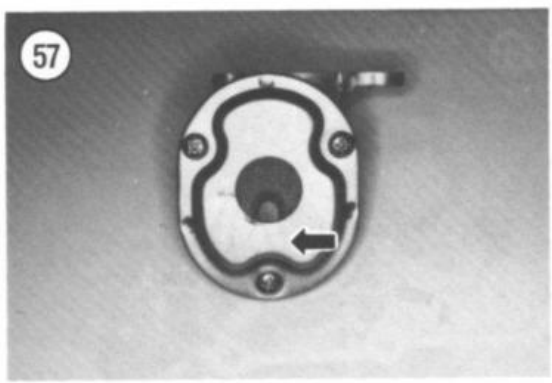






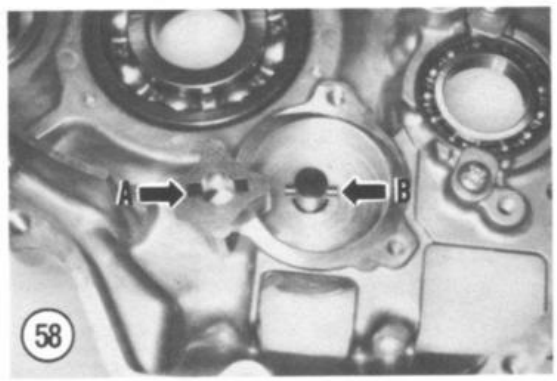
6. Check the No. 2 oil pump cover (**Figure 56**) for cracks or other damage. Check that the drive shaft rotates freely with no binding. Replace the assembly if necessary.
7. Inspect the strainer screen (**Figure 57**) in the No. 2 oil pump cover assembly. Check for deterioration or broken areas in the screen; replace the strainer if necessary.





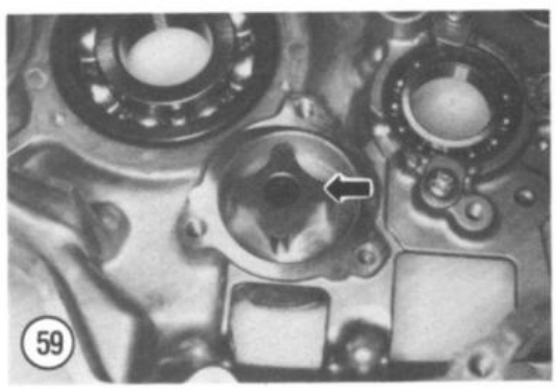
Assembly/Installation

1. Apply clean engine oil to all components.
2. If the oil pump was disassembled or cleaned in solvent, pour clean engine oil into the 2 openings in the backside of the No. 1 oil pump. This will prime the pump for the first start up.
3. Install the No. 1 oil pump assembly. Apply blue Loctite (No. 242) to the screw threads prior to installation. Install the screws (A, **Figure 51**) and tighten securely.
4. Install the dowel pin (**Figure 50**) into the No. 1 oil pump drive shaft. Center it in the shaft.
5. Align the groove (A, **Figure 58**) in the bottom of the inner rotor with the pin (B, **Figure 58**) in the shaft and install the inner rotor (**Figure 59**). Make sure the inner rotor is meshed properly with the pin. This is necessary for proper oil pump operation.
6. Position the outer rotor with the punch mark facing in toward the crankcase receptacle (**Figure 60**) and install the outer rotor (**Figure 61**). At this time both rotors must be flush with the top surface of the crankcase cavity, if not they are installed incorrectly and must be removed and installed correctly before proceeding.
7. Fill the cavity with clean engine oil.
8. Install the No. 2 oil pump cover (C, **Figure 48**) assembly onto the crankcase.

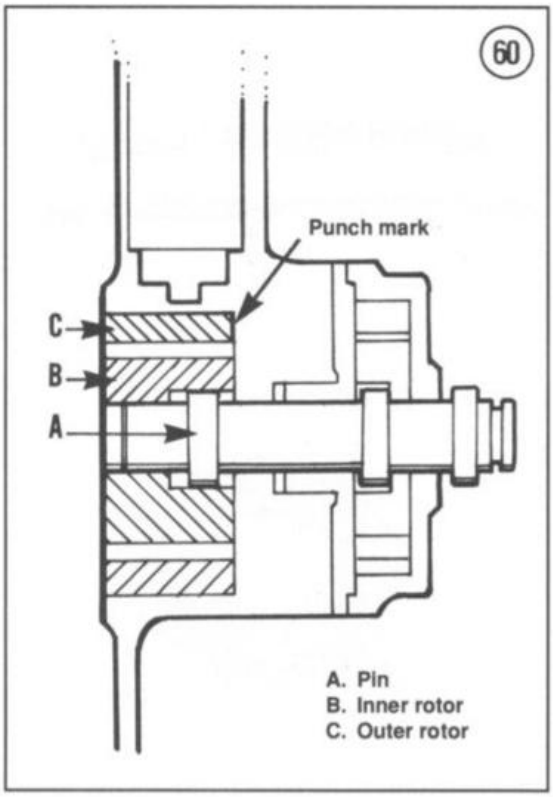


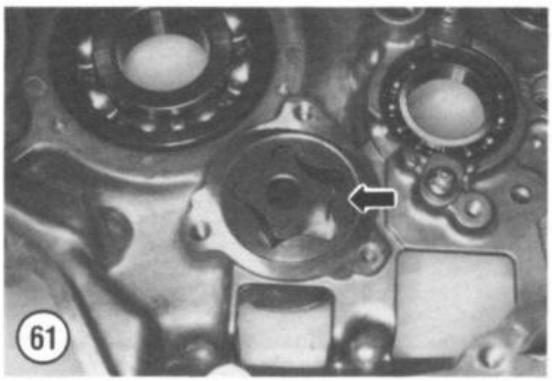
CAUTION

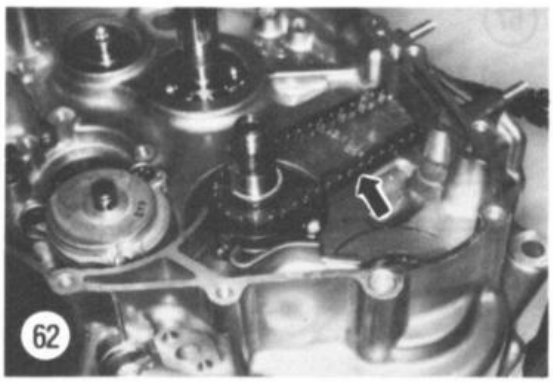
The location of the Phillips head screws is critical for clearance of other components within the crankcase. Be sure to install the countersunk Phillips head screws in the correct location to avoid component damage.



9. Apply blue Loctite (No. 242) to all screw threads prior to installation.
10. Install the single round head Phillips head screw (A, **Figure 48**) and the 2 countersunk Phillips head screws (B, **Figure 48**) securing the No. 2 oil pump







cover assembly to the inner surface of the crankcase. Tighten the screws securely.

11. Assemble the crankcase as described in this chapter.

12. Install the washer (**Figure 47**) and the dowel pin (**Figure 46**) onto the oil pump drive shaft. Center the dowel pin.

13. Align the groove in the oil pump driven gear with the dowel pin and install the gear (**Figure 45**).

14. Install the circlip (**Figure 44**) securing the oil pump driven gear to the shaft. Make sure the circlip is correctly seated in the shaft groove. Spin the gear slowly at first to make sure both oil pump assemblies are rotating freely.

15. Install the engine into the frame as described in this chapter.

CAMSHAFT CHAIN

Removal/Installation

1. Remove the cylinder head and cylinder as described in Chapter Four.

2. Remove the clutch and primary drive gear as described in Chapter Six.

3. Remove the camshaft chain (**Figure 62**) from the camshaft sprocket on the crankshaft.

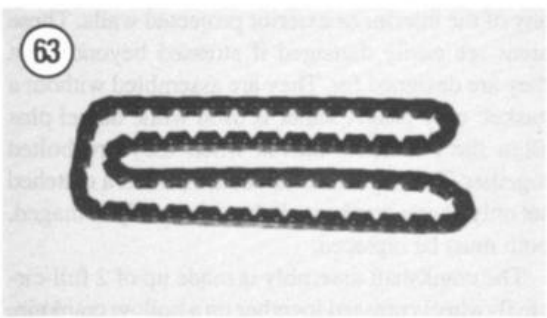
4. Inspect the parts as described in this chapter.

5. Install by reversing these removal steps. Install the camshaft chain onto the camshaft sprocket on the crankshaft (**Figure 62**). Make sure it is properly meshed with the sprocket.

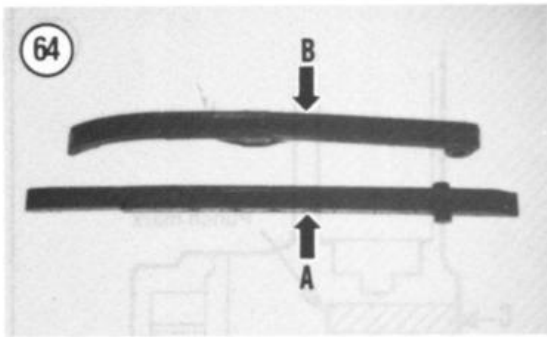
Inspection

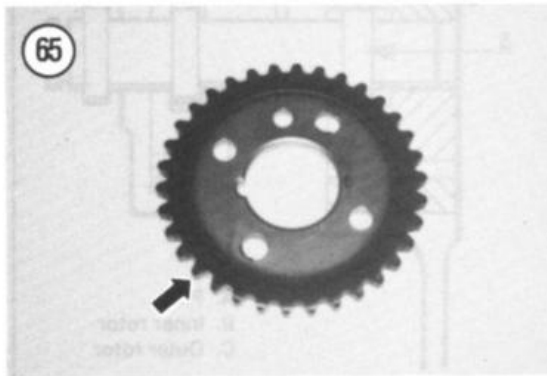
1. Clean the camshaft chain in solvent and thoroughly dry.

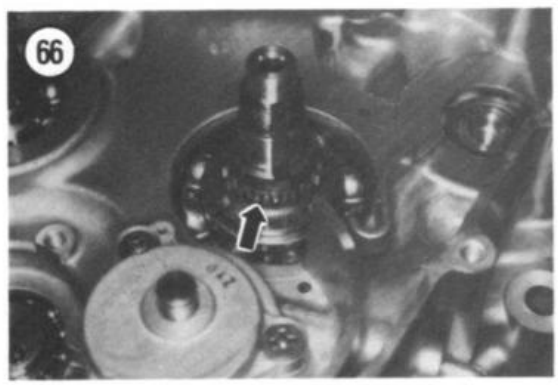
2. Inspect the camshaft chain (**Figure 63**) for wear or damage.

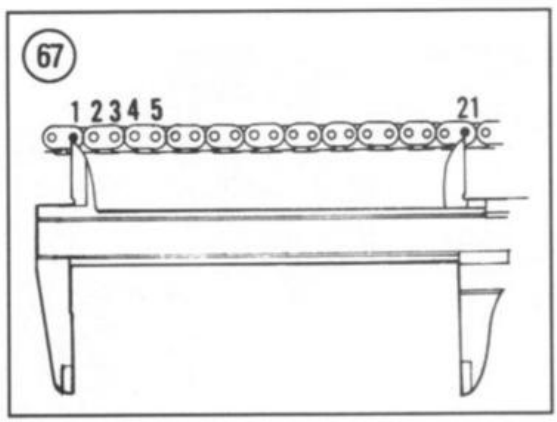


3. If the camshaft chain is worn, both upper and lower sprockets as well as the camshaft chain guide and tensioner are probably worn also. Inspect all parts closely. Running the engine with new and used parts will cause rapid wear to the new parts. Always replace these parts as a set.
4. Check the camshaft chain guide (A, **Figure 64**) tensioner (B, **Figure 64**) for wear, damage or cracks. Replace if necessary.
5. Inspect the camshaft driven sprocket. Check the driven sprocket for worn or damaged gear teeth (**Figure 65**). Also check the teeth for cracking or rounding, replace if necessary.
6. Inspect the camshaft drive sprocket (**Figure 66**) on the crankshaft for chipped or missing teeth, wear or damage. Replace the sprocket if necessary.
7. Measure the camshaft drive chain for stretching as follows:
   a. Place the chain on a flat surface and pull the chain taut to remove all slack.
   b. Use a Vernier caliper and measure the distance between 21 pins (or 20 pitches) (**Figure 67**).
   c. Repeat Steps 7a and 7b several times at various locations around the chain. This type of chain rarely wear and stretch evenly.
   d. If the chain has stretched to the service limit of 128.9 mm (5.07 in.) or greater, replace the chain.









CRANKCASE AND CRANKSHAFT

Disassembly of the crankcase—splitting the cases—and removal of the crankshaft assembly requires engine removal from the frame. However, the cylinder head, cylinder and all other attached assemblies should be removed with the engine in the frame as described in Chapter Four and this chapter.

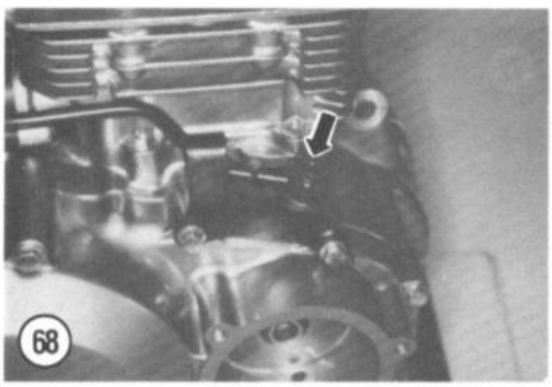
The crankcase is made in 2 halves of precision die cast aluminum alloy and is of the "thin-walled" type. To avoid damage to them do not hammer or pry on any of the interior or exterior projected walls. These areas are easily damaged if stressed beyond what they are designed for. They are assembled without a gasket; only gasket sealer is used while dowel pins align the crankcase halves when they are bolted together. The crankcase halves are sold as a matched set only. If one crankcase halve is severely damaged, both must be replaced.

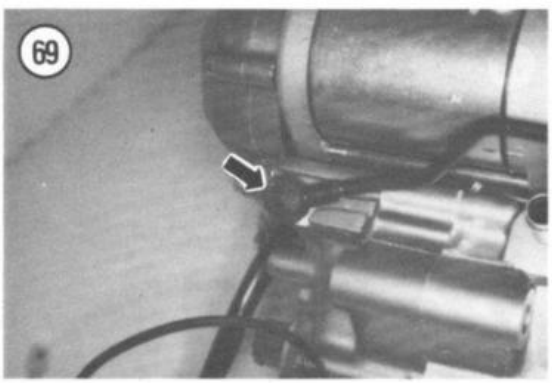
The crankshaft assembly is made up of 2 full-circle flywheels pressed together on a hollow crankpin.

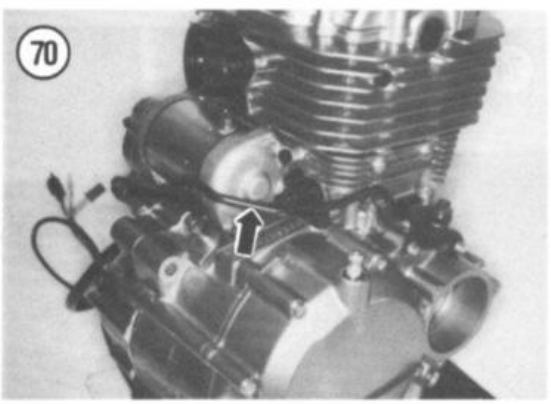
The connecting rod big end bearing on the crankpin is a needle bearing assembly. The crankshaft assembly is supported by 2 ball bearings in the crankcase.

The procedure which follows is presented as a complete, step-by-step major lower end overhaul that should be followed if the engine is to be completely reconditioned.

Remember that the right- and left-hand side of the engine relates to the engine as it sits in the bike's frame, not as it sits on your workbench.







Special Tools

When separating the crankcase halves a special tool is required. Use the Suzuki special tool, Crankcase Separator/Crankshaft Remover, (part No. 09920-13120) when separating the crankcase halves.

When removing the crankshaft from the left-hand crankcase, the same special tool used to separate the crankcase halves is required to remove the crankshaft. Use the Suzuki special tool, Crankcase Separator/Crankshaft Remover (part No. 09920-13120), when removing the crankshaft from the left-hand crankcase.

When installing the crankshaft into the left-hand crankcase a special tool is required to install the crankshaft. Use the Suzuki special tool, Crankshaft Installer, (part No. 09910-32812) when installing the crankshaft into the left-hand crankcase.

Remember, the crankshaft and crankcase halves can be easily damaged by improper crankshaft removal and installation techniques.

Crankcase Disassembly

This procedure describes disassembly of the crankcase halves and removal of the crankshaft, balancer shaft, transmission shaft assemblies and the internal shift mechanism. Disassembly and reassembly of the transmission and the internal shift mechanism assemblies are described in Chapter Seven.

NOTE

Be sure to remove the neutral indicator switch, small pin and spring from the end of the shift drum, to avoid misplacing them. Refer to the procedure in Chapter Nine.

1. Remove the engine as described in this chapter.
2. Remove the union bolt and sealing washers securing the external oil line at the front (**Figure 68**) and at the rear (**Figure 69**) and remove the oil line assembly (**Figure 70**) from the top of the crankcases. Place the union bolts and sealing washers in a reclosable plastic bag and tape it to the oil line assembly.
3. Remove all exterior engine assemblies from the crankcase assembly as described in this chapter and other related chapters.

4. Remove the bolt (A, **Figure 71**) and washer (B, **Figure 71**) securing the right-hand end of the balancer shaft assembly.
5. Note the position of any electrical harness clamps (A, **Figure 72**) attached to the crankcase bolts. They must be reinstalled in the same location.
6. To avoid damaging the countershaft oil seal when the countershaft is removed, install a thin O-ring in the drive sprocket circlip groove (B, **Figure 72**) in the end of the transmission countershaft.
7. Place the engine assembly on a couple of wood blocks with the left-hand side facing up.

NOTE

*On electric start models, don't forget the bolt (**Figure 73**) in the starter reduction gear housing area.*

8. Loosen all bolts on the left-hand side securing the crankcase halves together one-quarter turn. To prevent warpage, loosen them in a crisscross pattern.

NOTE

To prevent losing the bolts and to ensure proper location during assembly, draw the left-hand crankcase outline on cardboard, then punch holes to correspond with bolt locations. Insert the bolts in their appropriate locations.

9. Remove all bolts loosened in Step 10. Be sure to remove all of them.

NOTE

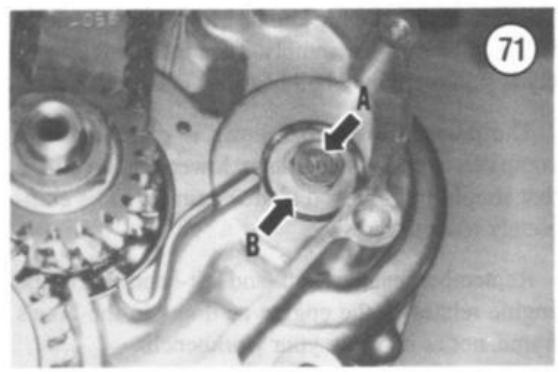
There are no crankcase bolts on the right-hand side of the crankcase.

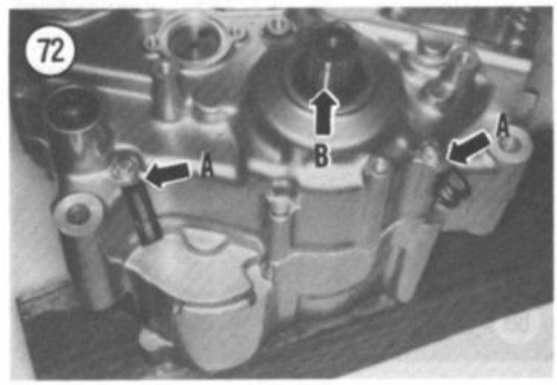
10. Turn the engine assembly over on a couple of wood blocks with the right-hand side facing up.

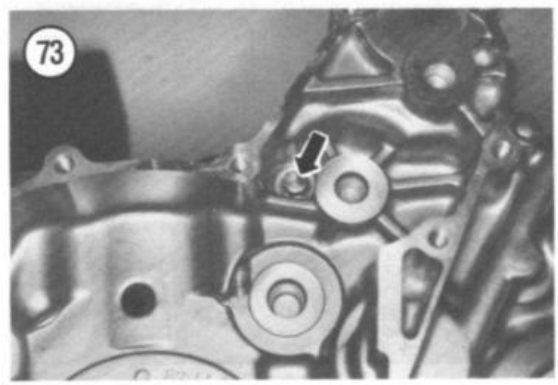
CAUTION

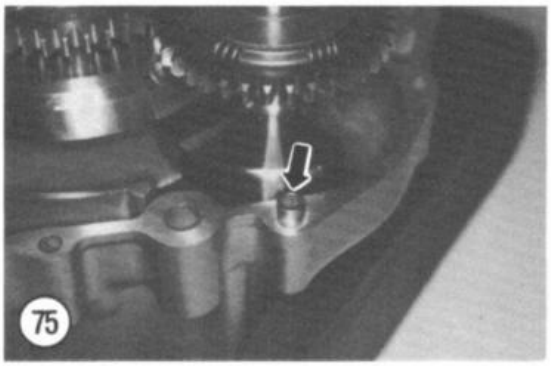
*Perform this operation over and close down to the work bench as the crankcase halves may easily separate. **Do not** hammer on the crankcase halves as they will be damaged.*

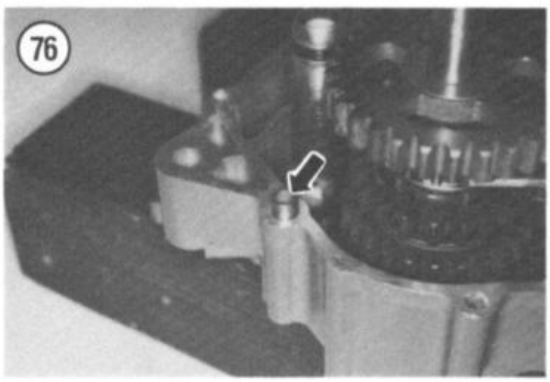
11. Install the Suzuki special tool, Crankcase Separator/Crankshaft Remover (part No. 09920-13120), onto the right-hand crankcase half and onto the end of the crankshaft. Make sure the arms of the special tool are parallel to the face of the right-hand crankcase cover mating surface. They must remain parallel during the disassembly procedure.

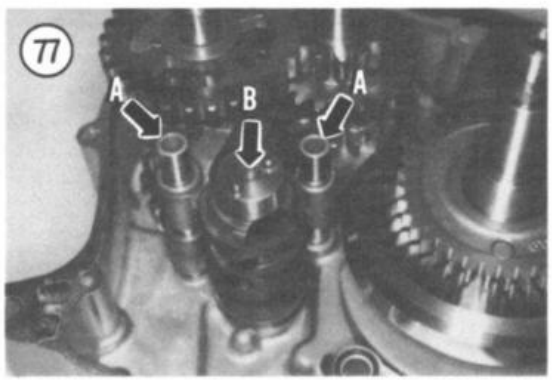


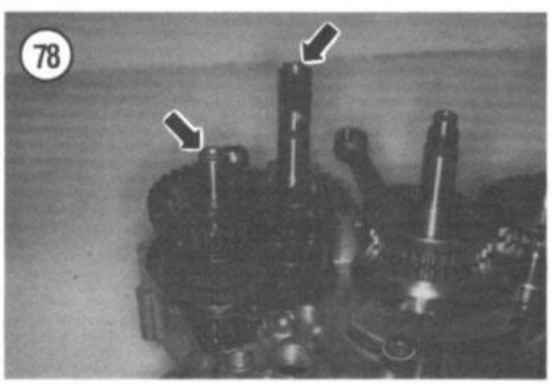












NOTE

The internal components, crankshaft, balancer shaft, transmission shafts and internal shift mechanism will stay in the left-hand crankcase half.

12. Slowly tighten the center bolt of the special tool and separate the crankcase halves. If necessary, use a plastic, soft-faced or rubber mallet and tap gently on the end of the transmission shafts to help during crankcase separation.

13. Carefully lift the right-hand crankcase assembly off of the left-hand half. Remove the special tool from the right-hand crankcase half.

NOTE

*Check the crankshaft and transmission shafts and the right-hand crankcase half for shims that may have been installed by a previous owner. There is one large washer (**Figure 74**) on the end of the transmission mainshaft and other than this washer there are no factory installed shims on the outer portion of the transmission shafts, balancer shaft or crankshaft.*

14. Remove the front dowel pin (**Figure 75**) and the rear dowel pin (**Figure 76**) from the left-hand crankcase half.

15. Remove the internal shift mechanism and transmission assemblies as follows:

a. Remove both shift fork shafts (A, **Figure 77**).

b. Note the location of the shift forks and mark them with a "L," (left) "C" (center) and "R" (right) so they can be reinstalled in the correct location.

c. Remove all 3 shift forks.

d. Remove the shift drum (B, **Figure 77**).

NOTE

It may be necessary to use a plastic, soft-faced or rubber mallet and tap the end of the transmission shafts in order to remove them from the crankcase.

e. Remove the 2 transmission shafts (**Figure 78**) as an assembly.

16. Remove the balancer assembly drive gear (A, **Figure 79**) and balancer shaft assembly (B, **Figure 79**).

17. Remove the crankshaft (**Figure 80**) from the left-hand crankcase half. If the crankshaft will not separate from the crankcase easily, perform Step 18.

NOTE

Use the same Suzuki special tool used in Step 11 for crankcase separation.

18. If the crankshaft will not separate easily from the crankcase, perform the following:

a. Install the Suzuki special tool, Crankcase Separator/Crankshaft Remover (part No. 09920-13120), onto the left-hand crankcase half and onto the end of the crankshaft. Make sure the arms of the special tool are parallel to the face of the left-hand crankcase cover mating surface. They must remain parallel during the removal procedure.

b. Slowly tighten the center bolt of the special tool and press the crankshaft out of the crankcase halves.

19. Remove the oil pump assembly as described in this chapter.

20. Remove the bolt (A, **Figure 81**) securing the oil pipe and remove the oil pipe (B, **Figure 81**) and O-ring seals.

21. Remove the O-ring seal (**Figure 82**) from the left-hand crankcase. Discard the O-ring as a new one must be installed during crankcase assembly.

Crankcase Inspection

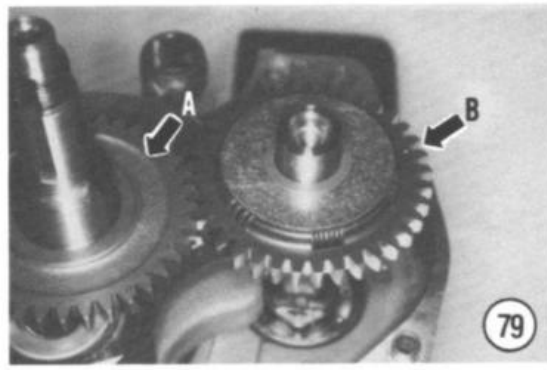
1. Remove the crankcase oil seals as described under *Bearing and Oil Seal Replacement* in this chapter.

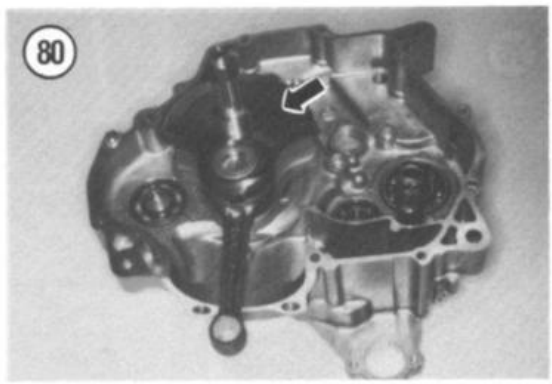
CAUTION

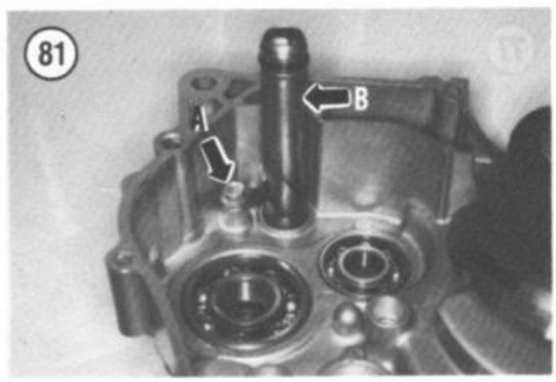
When drying the crankcase bearings in Step 2, do not allow the inner bearing race to spin. The bearing will be dry of all lubrication and damage will result. When drying the bearings, hold the inner race with your hand.

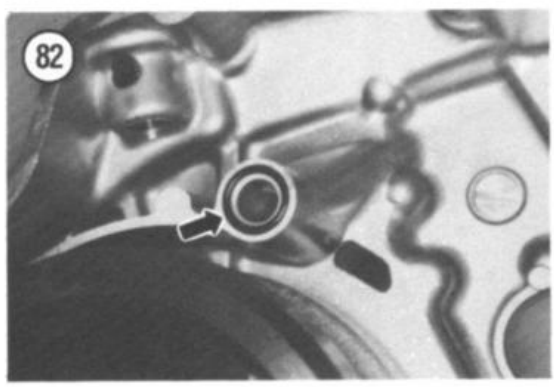
CAUTION

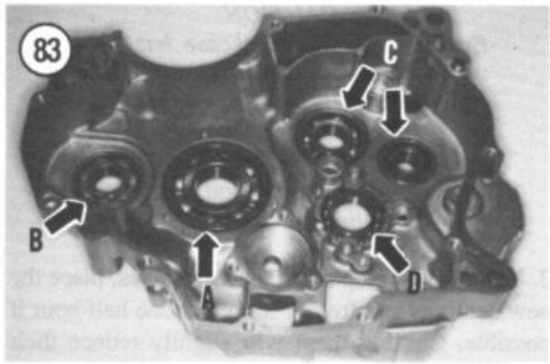
In addition when drying bearings with compressed air, never allow the air jet to rotate the bearing. The jet is capable of rotating the bearing at speeds far in excess of those for which they were designed. The likelihood of a bearing disintegrating and causing serious injury and damage is very great.

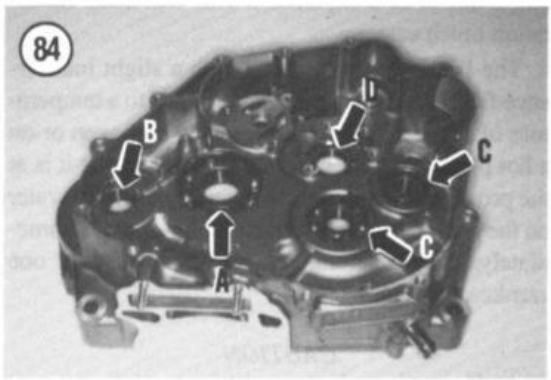


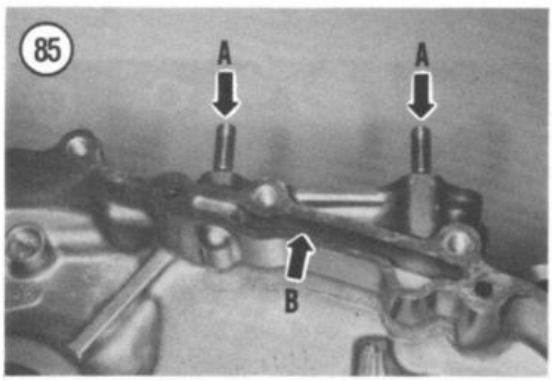


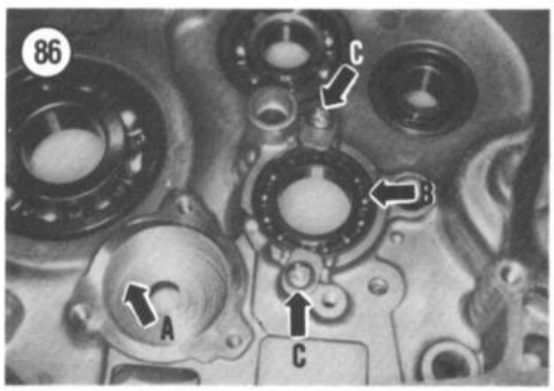












2. Clean both crankcase halves inside and out and all crankcase bearings with cleaning solvent. Thoroughly dry with compressed air and wipe off with a clean shop cloth. Be sure to remove all traces of old gasket sealer from all mating surfaces.

3. Oil the crankshaft main bearings with engine oil before checking the bearings in Steps 4 and 5.

4. Check the crankshaft main bearings (A, **Figures 83 and 84**) for roughness, pitting, galling, and play by rotating them slowly by hand. If any roughness or play can be felt in the bearing it must be replaced.

5

NOTE

Always replace both crankcase main bearings as a set.

5. Check the balancer shaft bearings (B, **Figures 83 and 84**), the transmission shaft bearings (C, **Figures 83 and 84**) and the shift drum bearing (D, **Figures 83 and 84**) for roughness, pitting, galling and play by rotating them slowly by hand. If any roughness or play can be felt in the bearing it must be replaced.

6. Replace any worn or damaged bearings as described under *Bearing and Oil Seal Replacement* in this chapter.

7. Carefully inspect the crankcase halves for cracks and fractures, especially in the lower areas where they are vulnerable to rock damage. Also check the areas around the stiffening ribs, around bearing bosses and threaded holes. If any are found, have them repaired by a shop specializing in the repair of precision aluminum castings or replace the crankcase halves.

8. Check the crankcase studs (A, **Figure 85**) for tightness. Tighten securely if necessary. Inspect the threads for damage or dirt or oil buildup. If necessary, clean or repair the threads with a suitable size metric die. Coat the tap threads with kerosene or an aluminum tap and die fluid before use.

9. Check the crankcase bolt threaded holes in both crankcase halves for thread damage or dirt or oil buildup. If necessary, clean or repair the threads with a suitable size metric tap. Coat the tap threads with kerosene or an aluminum tap fluid before use.

10. On models so equipped, check the kickstarter stop for damage. Also check the stop bolts for tightness.

11. Inspect the No. 2 oil pump rotor receptacle (A, **Figure 86**) in the right-hand crankcase half. Inspect the No. 2 oil pump mounting bolt holes for damage.

12. Make sure the oil passageway (B, **Figure 85**) is clean. If necessary, clean them out with a wire brush, a piece of wire and solvent, then blow out with compressed air.

Bearing and Oil Seal Replacement

The primary bearings in the crankcase halves are not equipped with oil seals since each side of the crankcase is covered with a sealed crankcase cover. There is an oil seal for the transmission shaft, the shift lever shaft and on models so equipped, the kickstarter shaft in these two covers.

1. Pry out the oil seals with a screwdriver. Refer to **Figure 87** for the transmission and **Figure 88** for the gearshift lever shaft. Place a rag or wood block underneath the screwdriver to avoid damaging the crankcase. If the seals are old and difficult to remove, heat the cases as described later and use an awl to punch a small hole in the steel backing of the seal. Install a small sheet metal screw into the seal and pull the seal out with a pair of pliers.

CAUTION

Do not install the screw too deep or it may contact and damage the crankcase surface behind it.

NOTE

An impact driver with a Phillips bit (described in Chapter One) will be required to loosen the bearing retainer plate screws described in Step 2. Attempting to loosen the screws with a Phillips screwdriver may ruin the screw heads, thus preventing them from being removed.

2. The gearshift drum bearing (B, **Figure 86**) is held in position by 2 small retainers. Remove the screws (C, **Figure 86**) securing the retainers before removing the bearing. If it is not necessary to remove the bearing, check the retainer screws for tightness, tighten if necessary.

CAUTION

Before heating the crankcases in this procedure to remove the bearings, wash the cases thoroughly with detergent and water. Rinse and rewash the cases as required to remove all traces of oil and other debris.

CAUTION

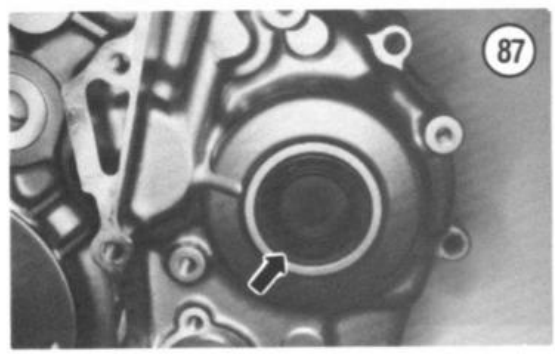
*Even though the crankcase has been washed there **may** be a residual oil or solvent odor left in the oven after heating the crankcase. If you use a household oven, first check with the person who uses the over for food preparation to avoid getting into trouble.*

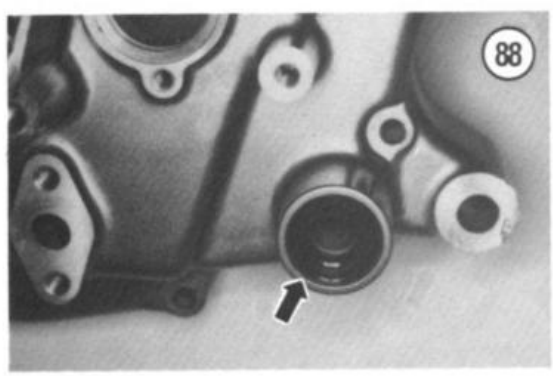
3. While heating up the crankcase halves, place the new bearings in a freezer for about one half hour if possible. Chilling them will slightly reduce their overall diameter while the hot crankcase is slightly larger due to heat expansion. This will make installation much easier.

4. The bearings are installed with a slight interference fit. The crankcase must be heated to a temperature of about 212° F (100° C) in a shop oven or on a hot plate. An easy way to check to see that it is at the proper temperature is to drop tiny drops of water on the crankcase; if they sizzle and evaporate immediately, the temperature is correct. Heat only one crankcase half at a time.

CAUTION

*Do **not** heat the cases with a torch (propane or acetylene)—never bring a*





flame into contact with the bearings or cases. The direct heat will destroy the case hardening of the bearings and will likely warp the case halves.

5. Remove the crankcase from the oven or hot plate and hold onto the crankcase with a kitchen pot holder, heavy gloves, or heavy shop cloths—*it is hot.*

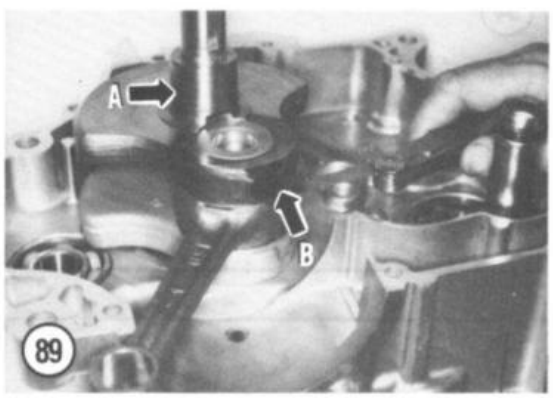
NOTE

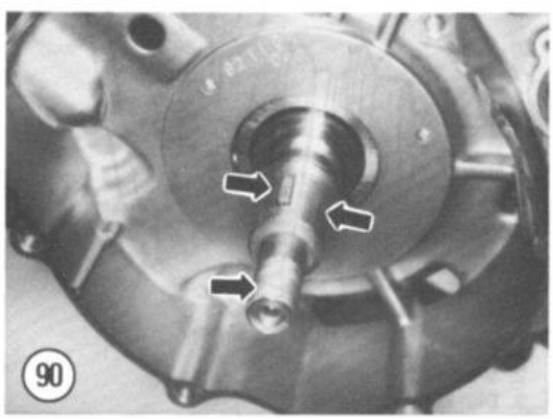
A suitable size socket and extension works well for removing and installing bearings.

6. Hold the crankcase with the bearing side down and tap the bearing out. Repeat for all bearings in that case half.

NOTE

Prior to installing new bearing(s) or oil seal(s) apply a light coat of lithium based grease to the inside and outside to aid in installation. Be sure to apply the same grease to the lips of new and/or old oil seals.





7. While the crankcase is still hot, press the new bearing(s) into place in the crankcase by hand until it seats completely. If necessary, tap the bearings into the case with a suitable size socket placed on the *outer* bearing race. Do not drive the bearing in by tapping on the inner bearing race as the bearing will be damaged.

NOTE

Always install bearings with the manufacturer's mark or number facing outward or so that after the crankcase is assembled you can still see these marks.

NOTE

Pack all crankcase oil seals with a heat durable grease before installation.

8. Oil seals can be installed with a suitable size socket and extension. When installing oil seals, it is important to drive the seal in squarely. Drive the seals in until they are flush with the surrounding surface area of the crankcase.
9. Align the shift drum bearing retainers with the crankcase. Apply blue Loctite (No. 242) to the retainer screws and tighten them securely.

Crankshaft Inspection

1. Clean the crankshaft thoroughly with solvent. Dry the crankshaft thoroughly. Then lubricate all bearing surfaces with a light coat of engine oil to prevent rusting.
2. Check the crankshaft journals (A, **Figure 89**) for scratches, heat discoloration or other defects. Also check for chatter marks and excessive or uneven wear. Minor cases of chatter marks can be cleaned up with 320 grit carborundum cloth. If 320 cloth is used, clean the crankshaft in solvent and check surfaces. If they did not clean up properly, disassemble the crankshaft and replace the damaged part.

NOTE

If one crankshaft half is damaged, the crankshaft can be disassembled and the damaged part replaced. Refer this type of work to a Suzuki dealer or competent machine shop.

3. On the left-hand end, check the flywheel taper, threads and key way (**Figure 90**) for damage. On the right-hand end, check the threads and key way (**Fig-**

ure 91) for damage. If necessary, clean or repair the threads with a suitable size metric thread die. Coat the die threads with kerosene or an aluminum tap and die fluid before using die.

4. Slide the connecting rod to one side and check the connecting rod to crankshaft side clearance with a flat feeler gauge (B, **Figure 89**). Compare to dimensions given in **Table 1**. If the clearance is greater than specified, the crankshaft assembly must be disassembled and the connecting rod replaced.

5. Check the crankshaft lower end area (**Figure 92**) for signs of seizure, bearing or thrust washer damage or connecting rod damage.

6. Check the connecting rod small end (**Figure 93**) for signs of excessive heat (blue coloration) or other damage.

7. Apply engine oil to the piston pin and install the pin into the connecting rod. Slowly rotate the piston pin and check for radial play (**Figure 94**). If any play exists, the piston pin should be replaced, providing the rod bore is in good condition.

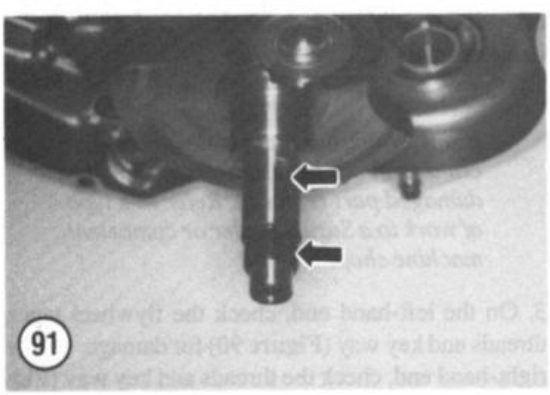
8. Inspect the camshaft drive chain sprocket. Check the sprocket for worn or damaged gear teeth. Also check the teeth for cracking or rounding, replace the gear if necessary.

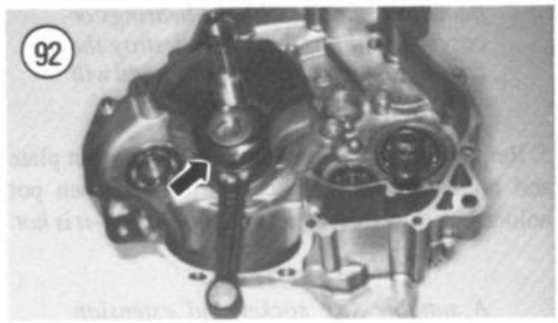
NOTE

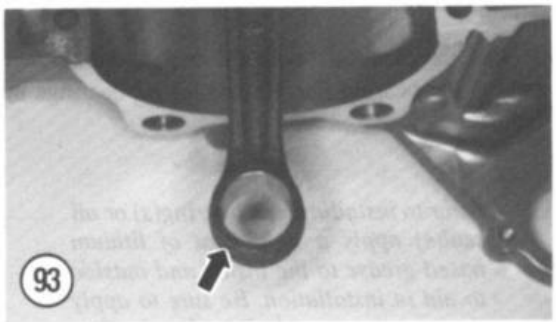
If the camshaft drive sprocket is worn, also check the camshaft driven sprocket, drive chain, chain guide and chain tensioner as described in Chapter Four and this chapter.

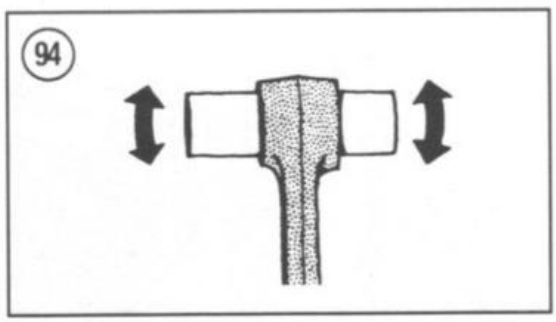
9. Check crankshaft runout with a dial indicator and V-blocks as shown in **Figure 95**. Retrue the crankshaft if the runout exceeds the service limit in **Table 1**.

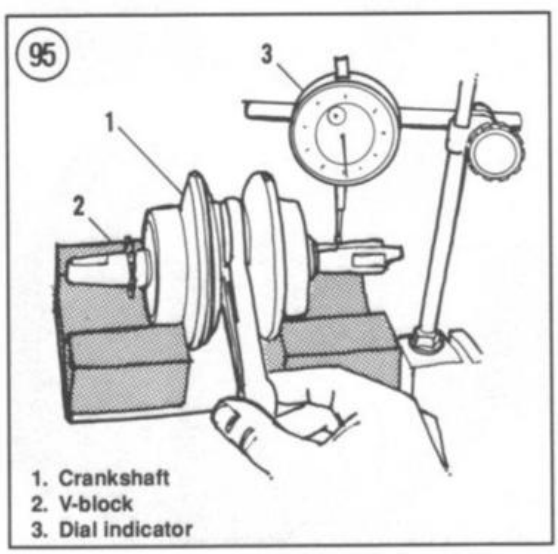
10. If necessary, have the crankshaft overhauled.











Balancer Shaft and Gears Inspection

Refer to **Figure 96** for this procedure.

1. Check the balancer shaft bearing journals (**Figure 97**) for deep scoring, excessive wear, heat discoloration or cracks.

2. Check the key way in the end of the balancer shaft for cracks or excessive wear.

3. Replace the balancer shaft if necessary.

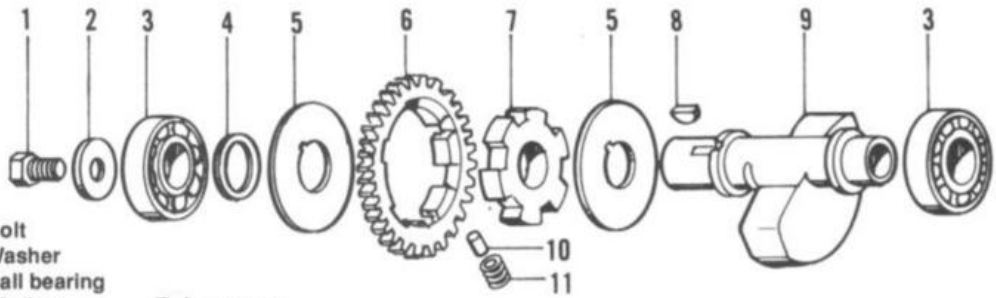
4. Inspect the balancer drive gear (A, **Figure 98**) for chipped or missing teeth. Make sure the locating pin (B, **Figure 98**) is secure in the gear. If worn or damaged, replace the drive gear.

5. Inspect the balancer driven gear and washers (**Figure 99**) for wear or damage.

CAUTION

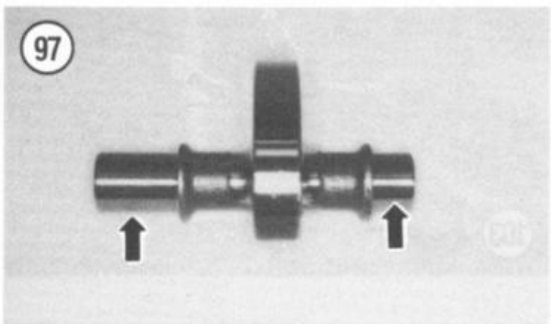
*If the driven gear has been disassembled to replace the damper springs, align the index marks (A, **Figure 100**)*

96 **BALANCER SHAFT**



1. Bolt
2. Washer
3. Ball bearing
4. Washer
5. Washer
6. Driven gear
7. Inner race
8. Woodruff key
9. Balancer shaft
10. Pin
11. Spring

97



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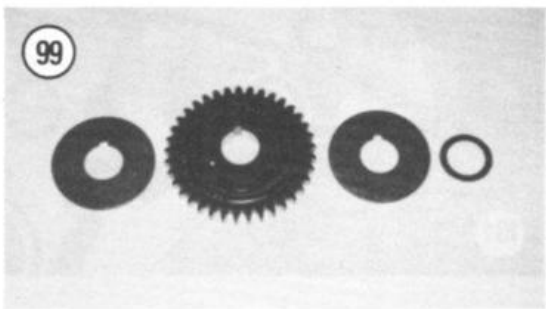

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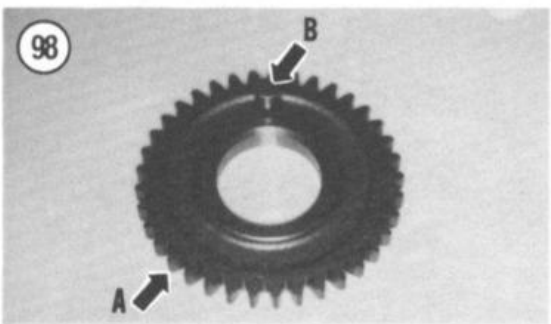

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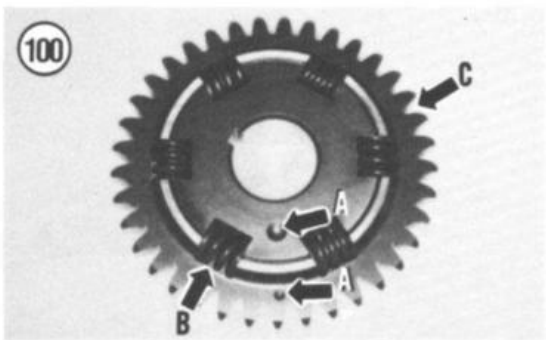


on the driven gear and the inner race. This alignment is necessary for proper alignment between the crankshaft and balancer shaft. If these index marks are not aligned the balancer system will not work as designed—resulting in severe vibration.

6. Check all damper springs (B, **Figure 100**) for wear or damage. Replace as a set even if only one or two are damaged. Inspect for chipped or missing teeth (C, **Figure 100**). If worn or damaged, replace the driven gear assembly.

Crankcase Assembly

1. Install a new O-ring seal (**Figure 101**) into the left-hand crankcase.

2. Install a new O-ring (**Figure 102**) onto each end of the oil pipe (B, **Figure 81**) and install the oil pipe. Install the bolt (A, **Figure 81**) securing the oil pipe and tighten securely.

3. Install the oil pump assembly as described in this chapter.

4. Apply engine oil to both crankshaft main bearings and to the bearing surfaces on the crankshaft.

CAUTION

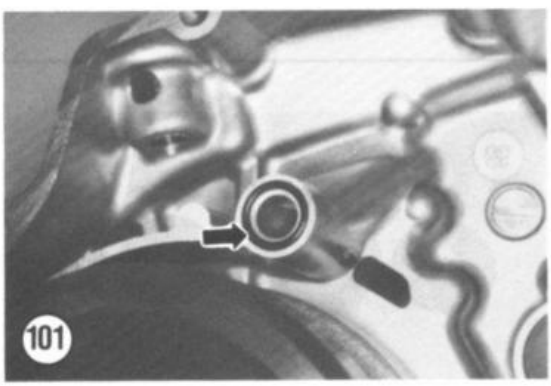
If you do not have access to a tool, have the crankshaft installed by a dealer or machine shop. Do not drive the crankshaft into the crankcase bearing with a hammer.

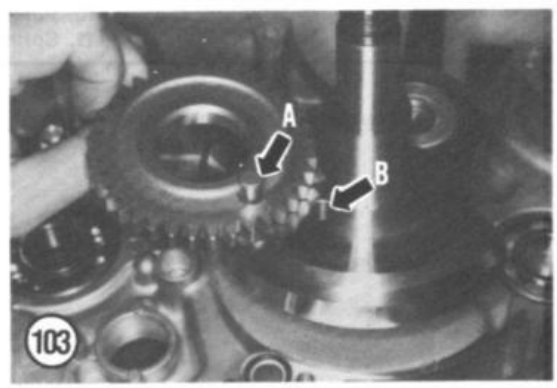
5. Install the crankshaft as follows:

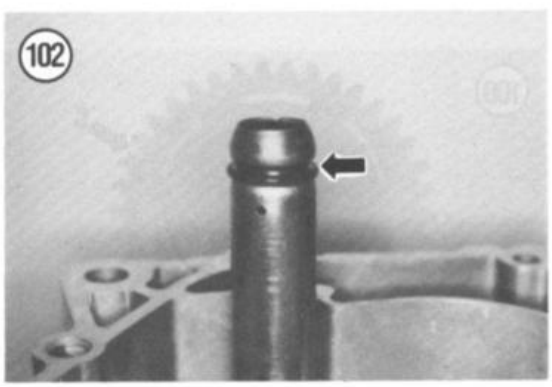
CAUTION

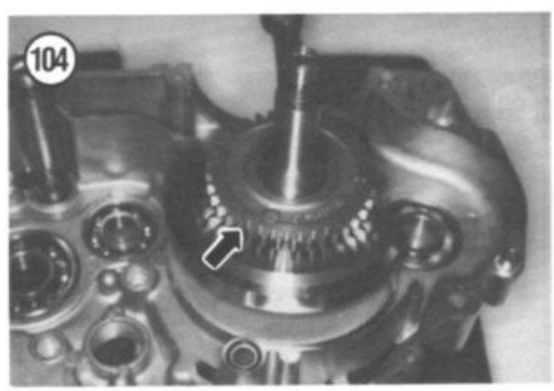
*When installing the crankshaft, make sure to position the connecting rod at top dead center (TDC) (**Figure 92**). If the connecting rod turns sideways it could catch onto the side of the crankcase; this would damage the connecting rod and the crankcase.*

a. Position the crankshaft with the tapered end going in first and start it into the left-hand crankcase half.
b. Install the Suzuki special tool, Crankshaft Installer (part No. 09910-32812), onto the left-









hand crankcase half and onto the end of the crankshaft.

c. Slowly tighten the threaded T-handle and pull the crankshaft into the left-hand crankcase half. Check the crankshaft often to make sure it is being pulled straight in with no side load. Pull the crankshaft until it is completely seated in the crankcase.

d. Remove the special tool.

e. After installing the crankshaft, remove the crankshaft tool. Then spin the crankshaft. It should turn freely without any signs of roughness or noise.

6. Place the left-hand crankcase and crankshaft assembly onto wood blocks.

7. Apply engine oil to the inner race of all bearings in the left-hand crankcase half.

8. Install the balancer drive gear as follows:

a. Position the balancer drive gear with the locating pin side going on first.

b. Install the gear and align the locating pin (A, **Figure 103**) with the receptacle (B, **Figure 103**) in the crankshaft.

c. Install the drive gear and push it down until it bottoms out (**Figure 104**).

9. Install the balancer shaft and driven gears as follows:

a. Position the balancer shaft with the short bearing surface (**Figure 105**) going in first.

b. Install the balancer shaft (**Figure 106**) and push it down until it bottoms out.

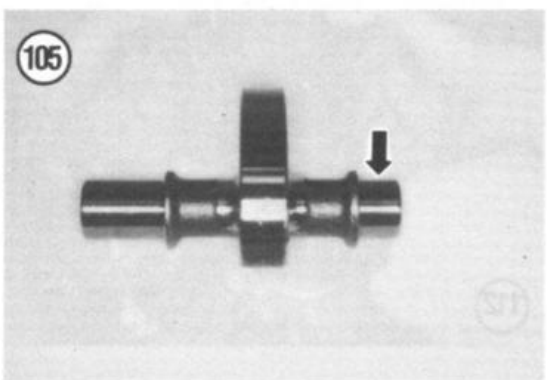
c. Install the key (A, **Figure 107**) into the balancer shaft and install the inner washer (B, **Figure 107**).

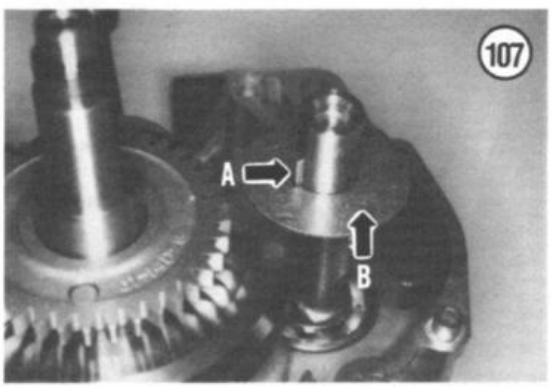
d. Rotate the crankshaft so the index mark on the drive gear is pointing directly at the balancer shaft.

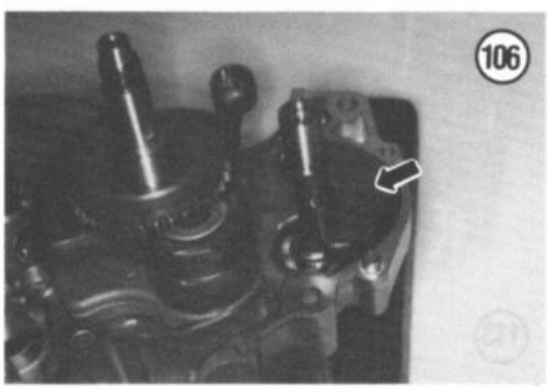
e. Position the balancer driven gear with the index mark facing up and start the gear onto the balancer shaft (**Figure 108**).

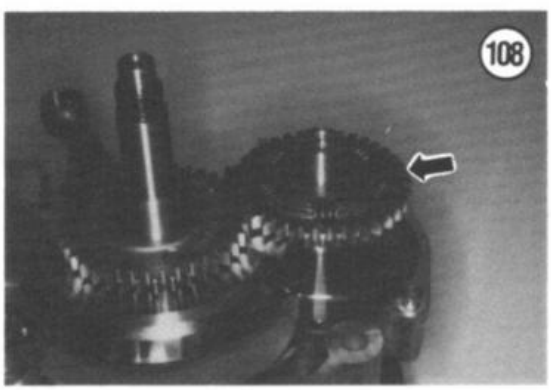
CAUTION

Always align the index marks on the drive and driven gears. This alignment is necessary for proper alignment between the crankshaft and balancer shaft. If these index marks are not aligned, the balancer system will not







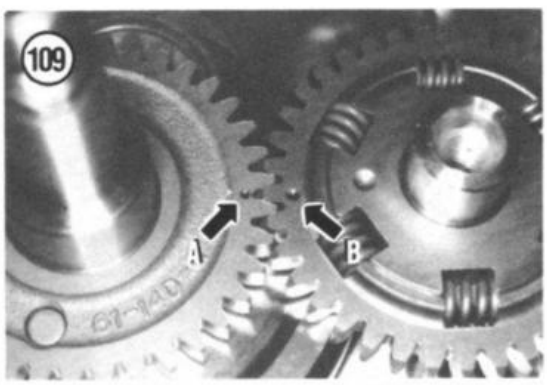


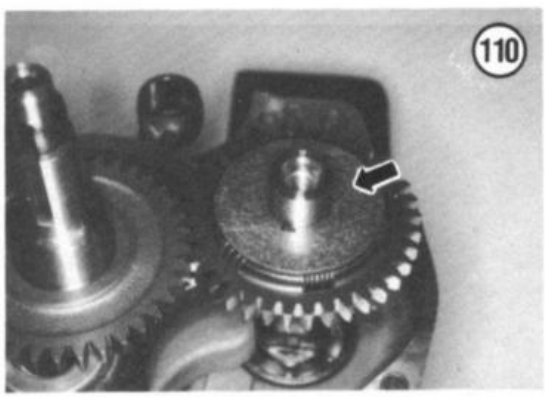
work as designed—resulting in severe vibration.

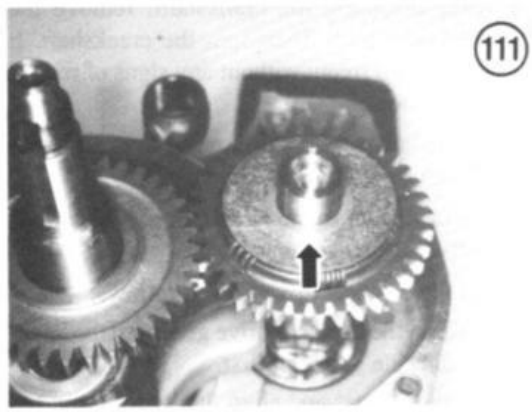
f. Continue to slide the driven gear down the balancer shaft (**Figure 108**), align the key way in the gear with the key in the shaft. Also align the index mark on the drive gear (A, **Figure 109**) and the driven gear (B, **Figure 109**). These two index marks must align or the balancer system will not work. Push the gear all the way down until it bottoms out.

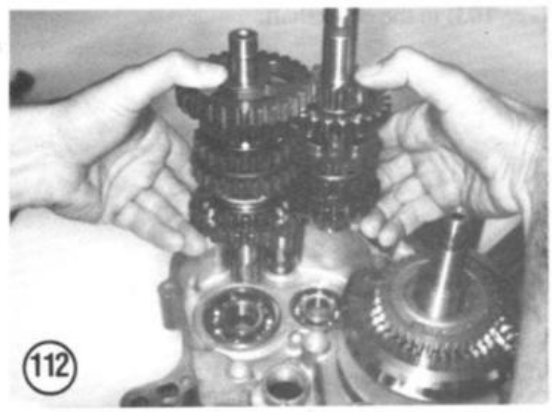
g. Install the outer washer (**Figure 110**) onto the balancer shaft, then install the small washer (**Figure 111**).

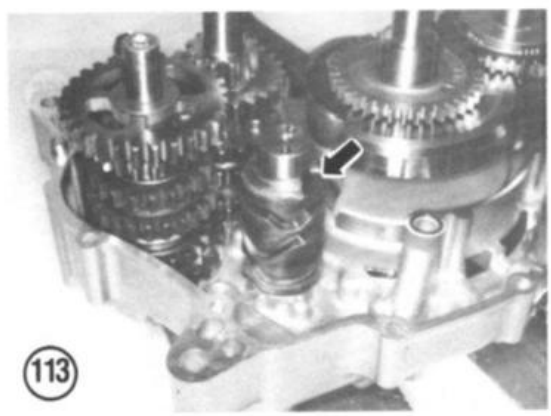
10. Install the transmission assembly as follows:
    a. If removed, install a thin O-ring onto the circlip groove in the countershaft. The O-ring will prevent the possibility of damage to the countershaft oil seal when the shaft is installed.
    b. Mesh the transmission shafts together (**Figure 112**) and install the transmission assembly into the left-hand crankcase bearings.
    c. After the transmission shafts have been installed, use a soft-faced or plastic mallet and tap on the end of both shafts (**Figure 78**) to make sure the shafts are completely seated.
11. Install the internal shift mechanism as follows:
    a. Install the shift drum (**Figure 113**).
    b. Refer to the marks (**Figure 114**) made in *Disassembly* Step 16 for correct shift fork location.
    c. Engage the center shift fork into the countershaft 3rd gear (**Figure 115**) fork groove.

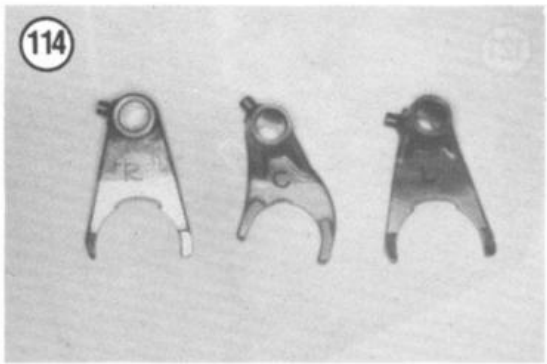


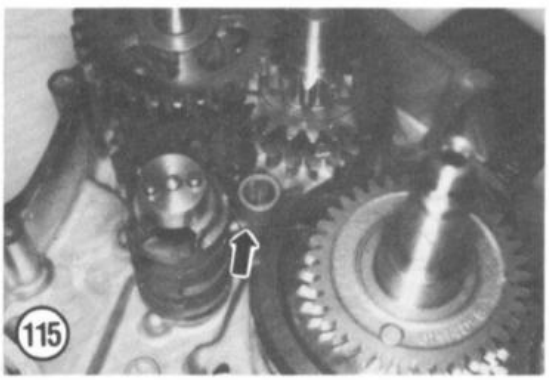


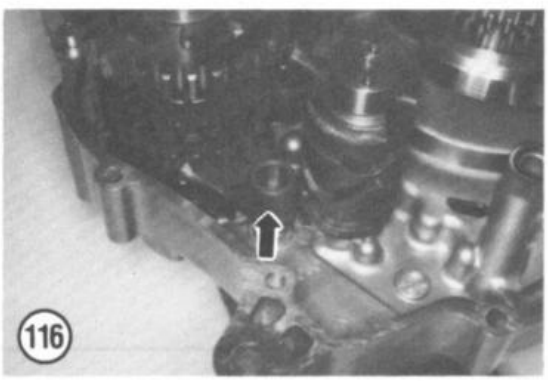


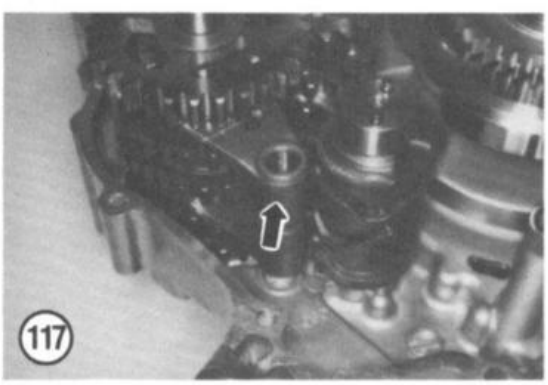










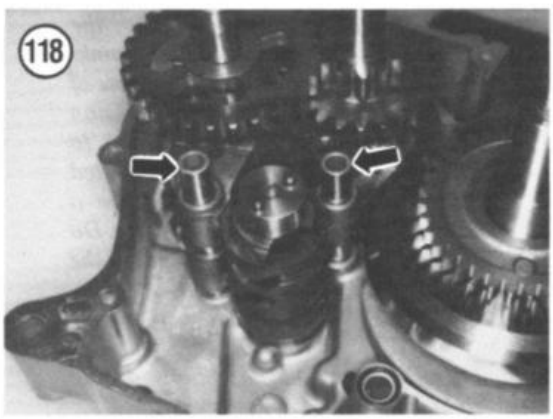


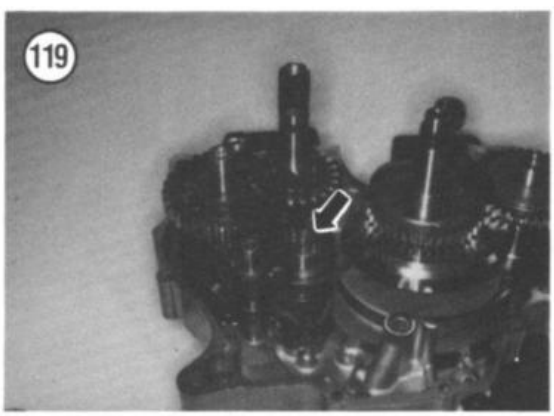
d. Engage the left shift fork into the mainshaft 5th gear (**Figure 116**) fork groove.
e. Engage the right shift fork into the mainshaft 4th gear (**Figure 117**) fork groove.
f. Pivot each of the shift forks into their respective groove in the shift drum.
g. Insert the shift fork shafts (**Figure 118**) into the shift forks. Push the shafts in until they bottom out in the crankcase receptacle.

NOTE

Step 12 is best done with the aid of a helper as the assemblies are loose and don't want to spin very easily. Have the helper spin the transmission shaft while you turn the shift drum through all the gears.

12. Spin the transmission shafts and shift through the gears using the shift drum (**Figure 119**). Make sure you can shift into all gears. This is the time to find that something may be installed incorrectly—not after the crankcase is completely assembled.





13. Install the front dowel pin (**Figure 120**) and the rear dowel pin (**Figure 121**) into the left-hand crankcase half.

NOTE

Make sure both crankcase mating surfaces are clean and free of all old gasket material. This is to make sure you get a leak free seal.

14. Apply a light coat of a *non-hardening liquid gasket* such as Three Bond or equivalent to the entire mating surfaces of the right-hand crankcase half. Also apply it to the left-hand crankcase half areas shown in **Figure 122**.

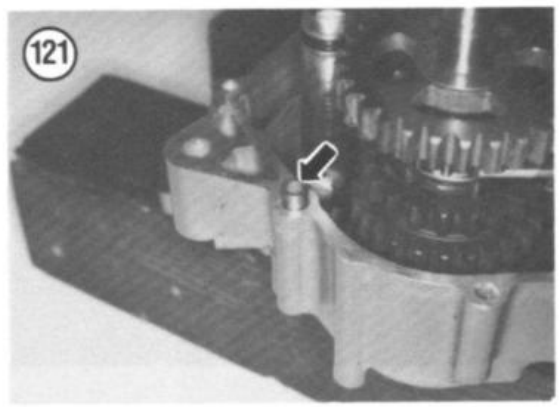
15. Set the right-hand crankcase half over the left-hand half on the blocks (**Figure 123**). Push it down squarely into place until it engages the dowel pins and then seats completely against the left-hand crankcase half.

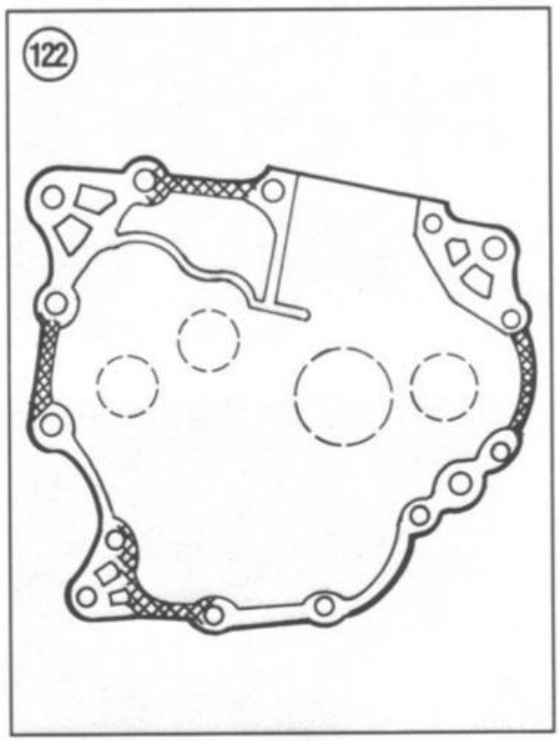
CAUTION

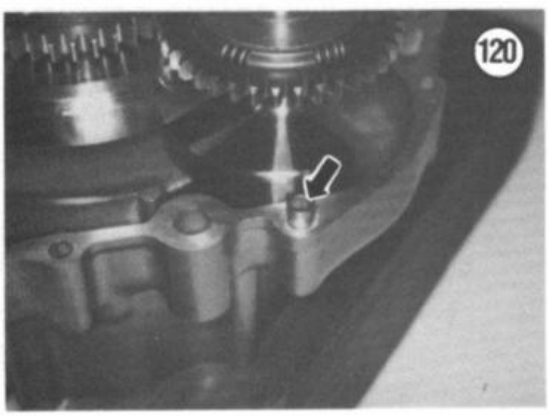
Crankcase halves should fit together without force. If the crankcase halves do not fit together completely, do not attempt to pull them together with the crankcase screws. Separate the crankcase halves and investigate the cause of the interference. If the transmission shafts were disassembled, recheck to make sure that a gear is not installed backwards. Crankcase halves are a matched set and are very expensive. Do not risk damage by trying to force the cases together.

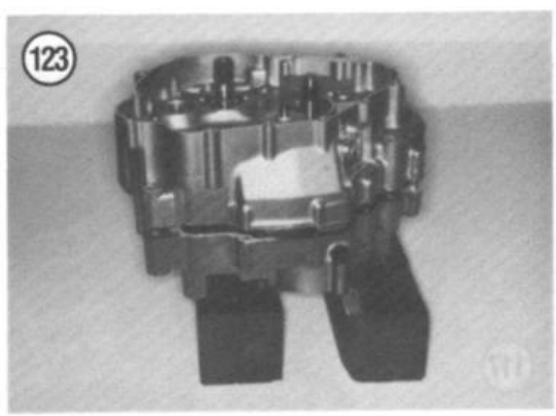
NOTE

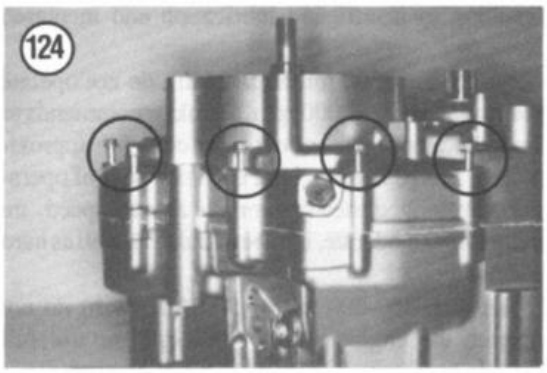
There are no crankcase bolts on the right-hand side of the crankcase.

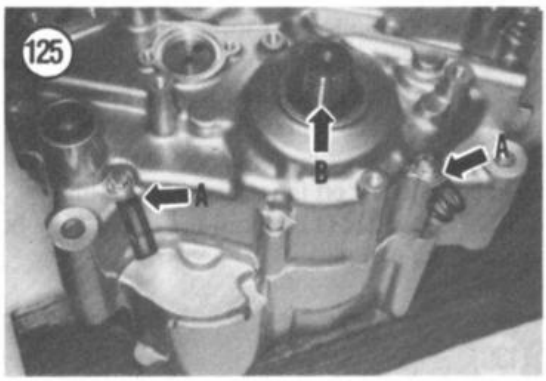


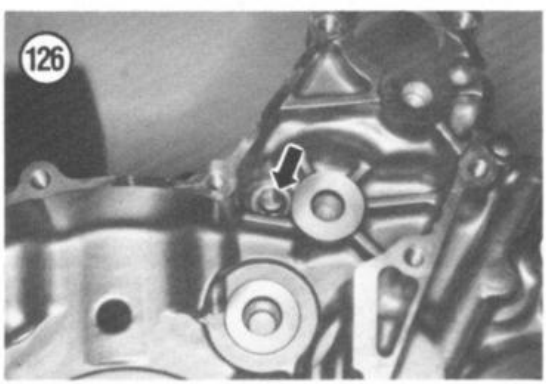


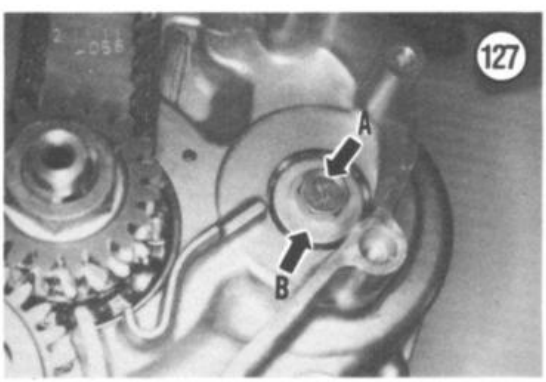












16. Turn the crankcase assembly over and install the bolts in the left-hand crankcase. Check that all bolt heads stick up the same amount from the crankcase surface (**Figure 124**). If any are above or below the rest, they are installed in the wrong hole, reposition at this time. Install the electrical harness clamps (A, **Figure 125**) in the correct location under the crankcase bolts. Tighten only finger-tight at this time.

17. Remove the protective O-ring (B, **Figure 125**) from the transmission shaft.

NOTE

*On electric start models, don't forget the bolt (**Figure 126**) in the starter reduction gear area.*

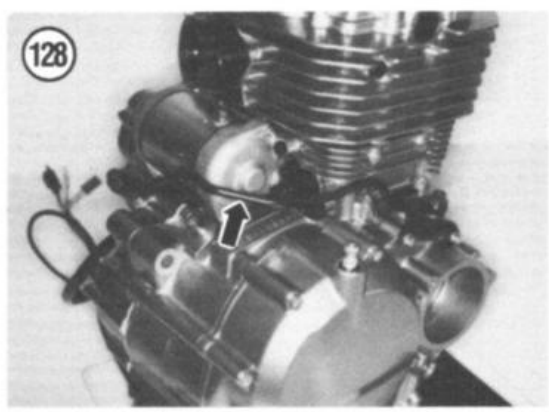
18. To prevent warpage, tighten the bolts in the left-hand crankcase in 2 stages in a crisscross pattern. Tighten to the torque specification listed in **Table 2**.

19. After the crankcase halves are completely assembled, rotate the crankshaft and transmission shafts to make sure there is no binding. If any is present, disassemble the crankcase and correct the problem.

20. Install the bolt (A, **Figure 127**) and washer (B, **Figure 127**) securing the right-hand end of the balancer shaft assembly. Tighten to the torque specification listed in **Table 2**.

21. Install all exterior engine assemblies as described in this chapter and other related chapters.

22. Install the oil line assembly (**Figure 128**) onto the top of the crankcases. Install the union bolt and new sealing washers securing the external oil line at the front (**Figure 129**) and at the rear (**Figure 130**). Tighten to the torque specification listed in **Table 2**.



23. Install the neutral indicator switch, small pin and spring into the end of the shift drum as described in Chapter Nine.

24. Install the engine as described in this chapter.

BREAK-IN PROCEDURE

If the rings were replaced, a new piston installed, the cylinder rebored or honed or major lower end work performed, the engine should be broken in just as though it were new. The performance and service life of the engine depends greatly on a careful and sensible break-in.

During break-in, oil consumption will be higher than normal. It is therefore important to frequently check and correct the oil level (Chapter Three). At no time during the break-in or later should the oil level be allowed to drop below the minimum level. If the oil level is low, the oil will become overheated resulting in insufficient lubrication and increased wear.

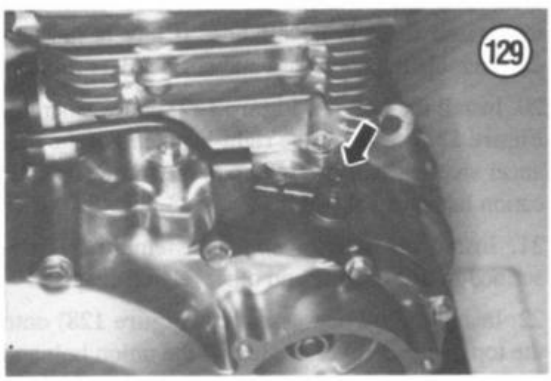
For the first 300 miles (500 km), do not operate the engine above 4,000 rpm. Suzuki recommends to stop the engine and allow it to cool for approximately 5 to 10 minutes after each one hour of operation. Prolonged steady running at one speed, no matter how moderate, is to be avoided as well as hard acceleration.

Between 300-600 miles (500-1,000 km) do not operate the engine above 5,000 rpm or use full throttle at any time.

After 600 miles (1,000 km), change the engine oil and filter as described in Chapter Three.

It is essential to perform this service to ensure that all of the particles produced during break-in are removed from the lubrication system. The small added expense may be considered a smart investment that will pay off in increased engine life.

After 600 miles (1,000 km) the engine may be operated at full throttle.



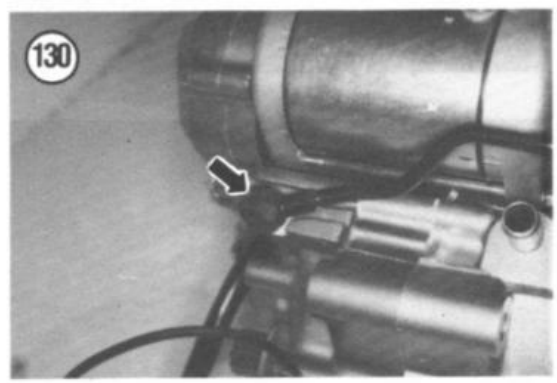


Table 1 CRANKSHAFT SERVICE SPECIFICATIONS

Item	Specifications mm (in.)	Wear limit mm (in.)
Crankshaft		
Runout limit	—	0.05 (0.002)
Connecting rod-to crankshaft side clearance	0.10-0.55 (0.004-0.022)	1.0 (0.04)
Small end OD		
250 cc	19.006-19.014 (0.7483-0.7486)	19.040 (0.7496)
350 cc	20.006-20.014 (0.7876-0.7880)	20.040 (0.7890)

Table 2 ENGINE LOWER END TIGHTENING TORQUES

	N•m	ft.-lb.
Engine mounting bolts and nuts		
Cylinder head-to-frame mounting bolts and nuts	37-45	27-32.5
Front mounting plate bolts and nuts		
Mounting plate-to-frame	18-28	13-20
Mounting plate-to-engine	60-72	43.5-52
Rear mounting plate bolts and nuts		
Mounting plate-to-frame	18-28	13-20
Lower front through bolt	60-72	43.5-52
Lower rear through bolt	60-72	43.5-52
Starter clutch one-way clutch		
Allen bolts	23-28	16.5-20
Crankcase bolts	9-13	6.5-9.5
Balancer shaft mounting bolt	40-60	29-43.5
External oil line union bolts	18-23	13-16.5

CHAPTER SIX

CLUTCH, KICKSTARTER AND EXTERNAL SHIFT MECHANISM

This chapter describes service procedures for the following sub-assemblies:

a. Clutch.
b. Clutch release mechanism.
c. Primary drive gear.
d. Kickstarter (models so equipped).
e. External shift mechanism.

These sub-assemblies can be removed with the engine in the frame. General clutch specifications are listed in **Table 1**. **Tables 1-2** are found at the end of the chapter.

CLUTCH COVER

Removal/Installation

1. Remove the engine as described in Chapter Five.

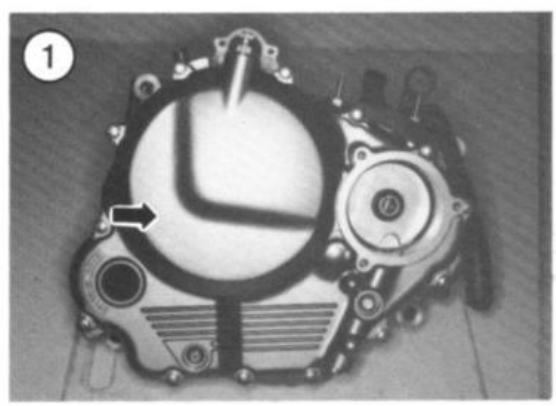
NOTE

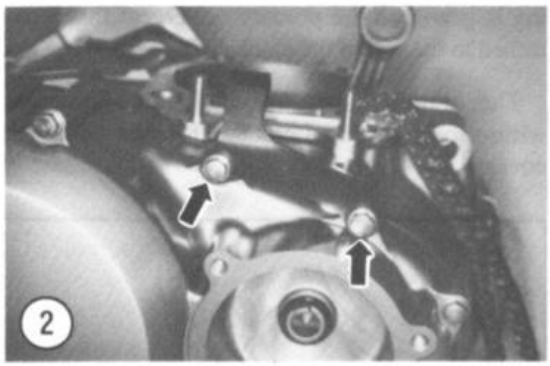
The following steps are shown with the engine partially disassembled for clarity. It is not necessary to remove any assemblies other that those specified in this procedure.

2. Remove the bolts securing the clutch cover and remove the cover (**Figure 1**). Note the location of the clutch cable bracket, special washers and bolts (**Figure 2**).

3. Remove the old gasket and both locating dowel pins. Discard the gasket as a new one must be installed.

4. Apply a *light* coat of silicone sealant to the back side of the gasket to hold it in place during cover





installation. This will help prevent the gasket from slipping down prior to installing the clutch cover.

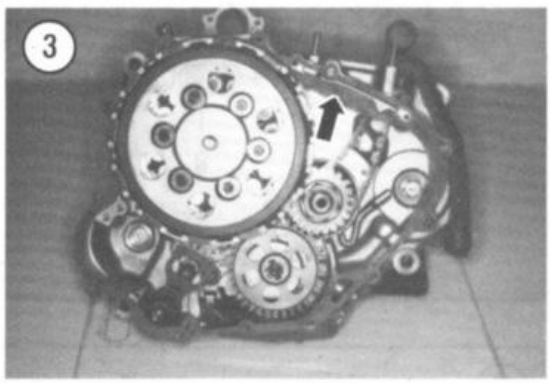
5. Install a new cover gasket (**Figure 3**).

6. Install the front (**Figure 4**) and rear (**Figure 5**) dowel pins.

7. Install the clutch cover and bolts. Don't forget the clutch cable bracket and bolts (**Figure 2**). Place a washer (**Figure 6**) on each side of the bracket bolt.

8. Install the engine as described in Chapter Five.

9. Adjust the clutch as described in Chapter Three.



Clutch Cover Oil Seal Replacement

Replace the kickstarter shaft oil seal if worn or damaged.

1. Remove the clutch cover as described in this chapter.

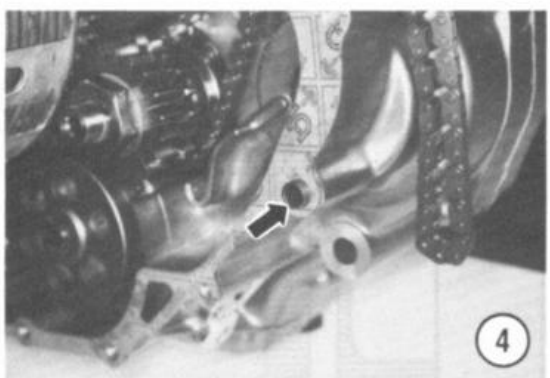
2. Remove the screw and retainer (A, **Figure 7**) securing the oil seal to the clutch cover.

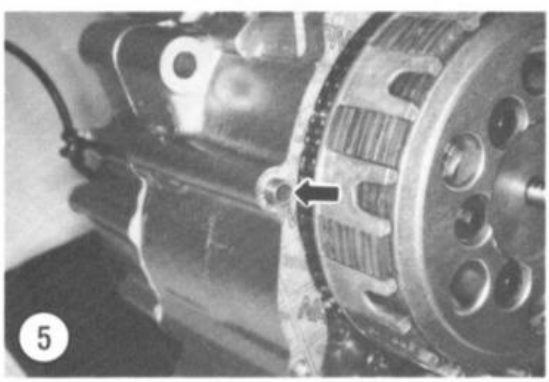
3. Carefully pry the oil seal (B, **Figure 7**) out of the cover with a flat tipped screwdriver. Place a rag underneath the screwdriver to avoid damaging the clutch cover.

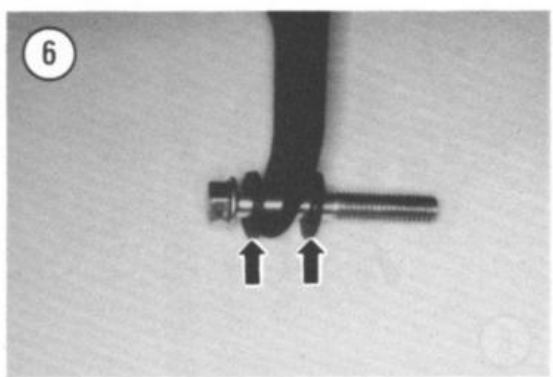
4. Remove all oil residue from the seal area and clean the cover thoroughly in solvent. Dry with compressed air.

5. Check the seal mounting area for any signs of damage. Repair with fine-grit sandpaper or a fine-cut file. Thoroughly clean the area with solvent to remove any sandpaper or filing residue.

6. Install the new seal by tapping it into the cover with a suitable size socket placed on the outer seal surface. Tap the seal in squarely until it is flush with the case.







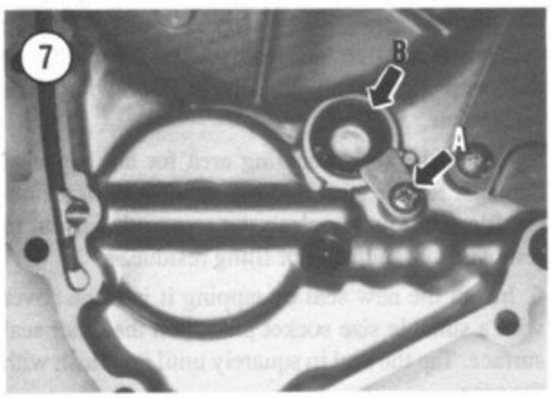
Clutch Cover Oil Check Ball (1993-on Models) Removal/Installation

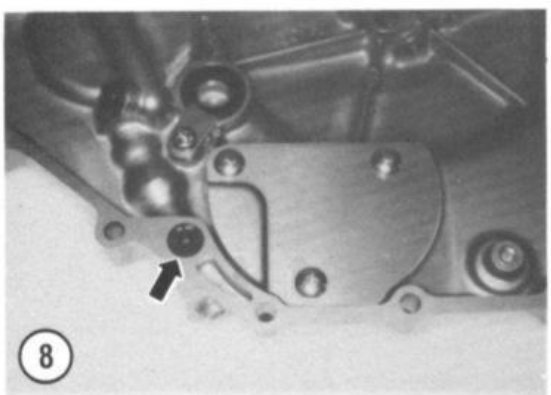
1. Remove the clutch cover as described in this chapter.
2. Carefully remove the bushing from the clutch cover. Refer to **Figure 8** and A, **Figure 9**.
3. Remove the check ball (B, **Figure 9**) and spring (C, **Figure 9**) from the clutch cover.
4. Install by reversing these removal steps while noting the following:
   a. Apply a light coat of oil to all parts prior to installation.
   b. Install all parts in the order shown in **Figure 10**.

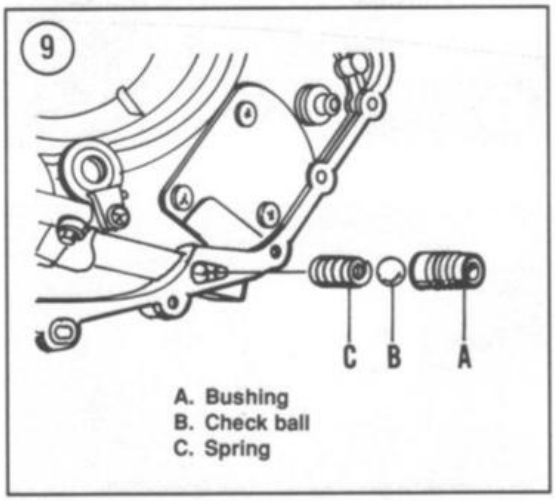
CLUTCH

The clutch is a wet multi-plate type which operates immersed in the oil supply it shares with the engine and transmission. The clutch boss is splined to the transmission mainshaft and the clutch housing can rotate freely on the mainshaft. The clutch housing is geared to the primary drive gear that is attached to the end of the crankshaft.

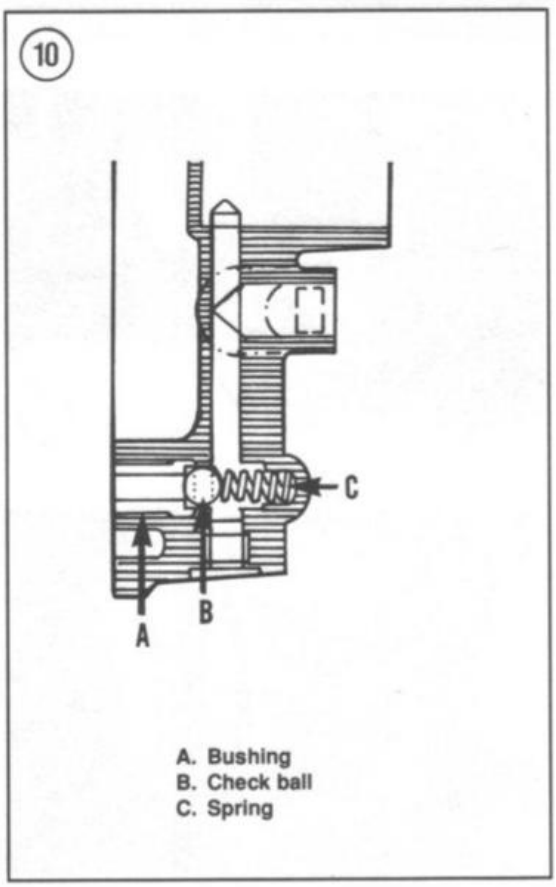
The clutch release mechanism is mounted within the right-hand crankcase cover or clutch cover.







A. Bushing
B. Check ball
C. Spring

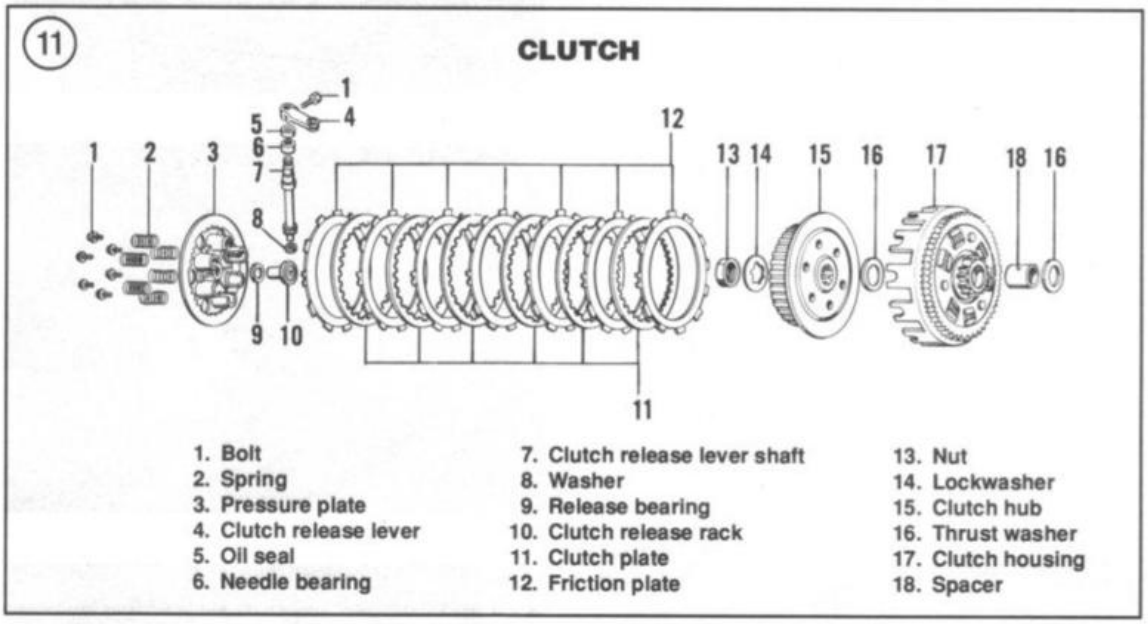


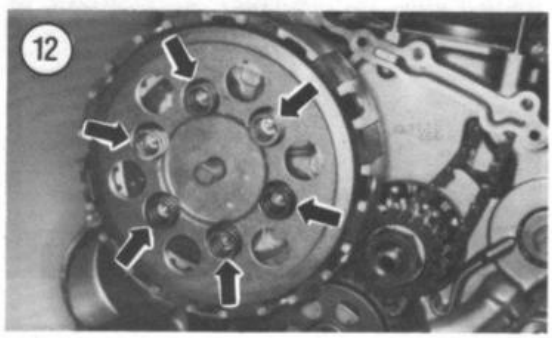
A. Bushing
B. Check ball
C. Spring

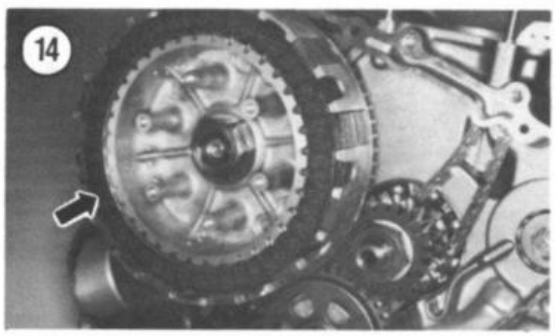
Removal

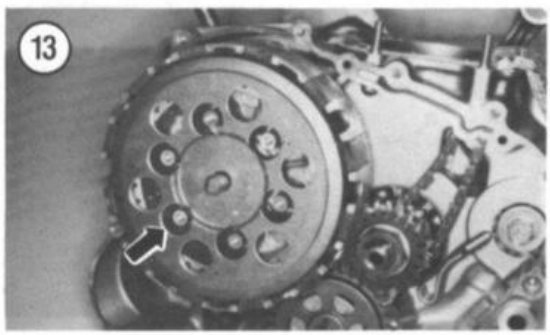
Refer to **Figure 11** for this procedure.

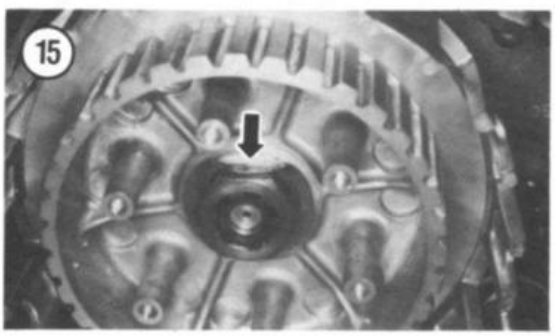
1. Remove the clutch cover as described in this chapter.
2. Loosen the clutch spring bolts in a crisscross pattern. Then remove the bolts.
3. Remove the clutch springs (**Figure 12**).
4. Remove the pressure plate (**Figure 13**).
5. Remove all friction plates and steel clutch plates (**Figure 14**) while keeping them in order.
6. Straighten the clutch nut lockwasher tab (**Figure 15**) away from the clutch nut.











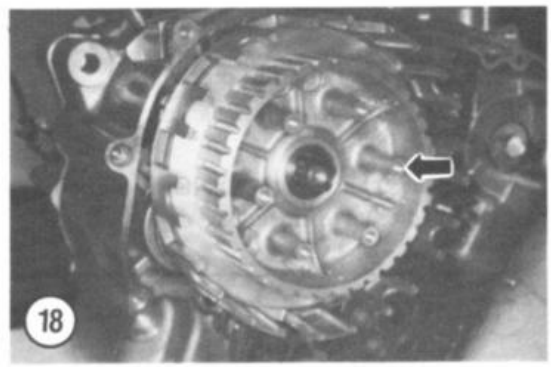
CAUTION

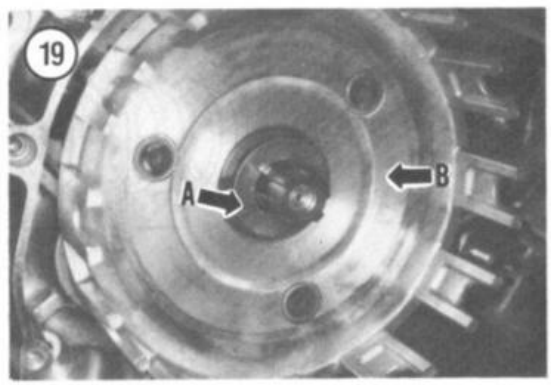
*In Step 7, do **not** insert a screwdriver or pry bar between the clutch housing and the clutch boss to try to keep the clutch boss from rotating. The fingers on the clutch housing are aluminum and are fragile and can be easily broken.*

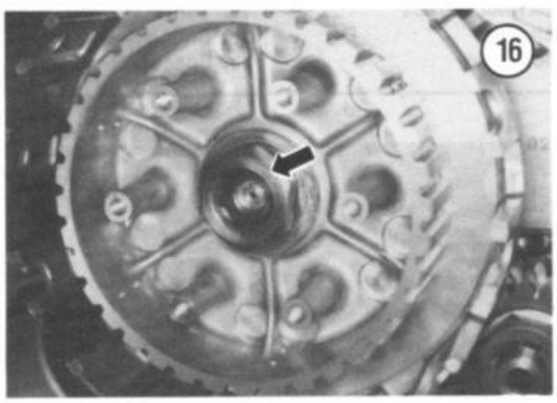
CAUTION

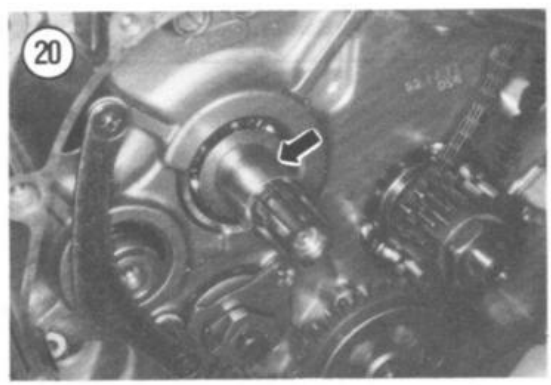
Do not clamp the "Grabbit," or equivalent, on to the clutch hub too tight as it may gall or damage the grooves in the clutch hub.

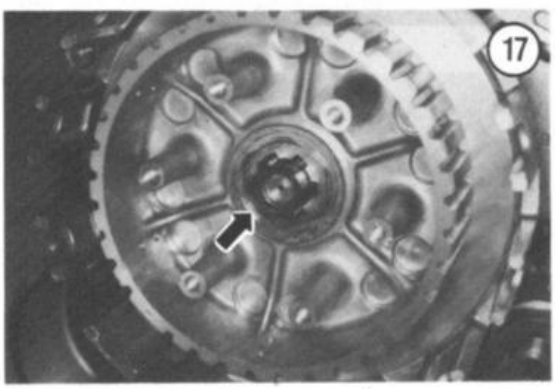
7. Secure the clutch hub with a holding tool such as the "Grabbit." Loosen then remove the clutch nut (**Figure 16**).
8. Remove the lockwasher (**Figure 17**).
9. Remove the clutch hub (**Figure 18**).
10. Remove the splined thrust washer (A, **Figure 19**).
11. Remove the clutch housing (B, **Figure 19**).
12. Remove the spacer (**Figure 20**) and washer (**Figure 21**) from the transmission shaft.

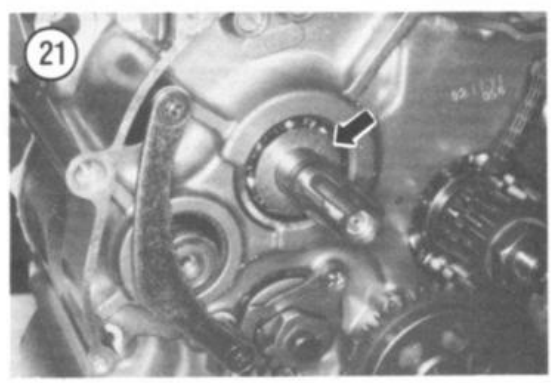


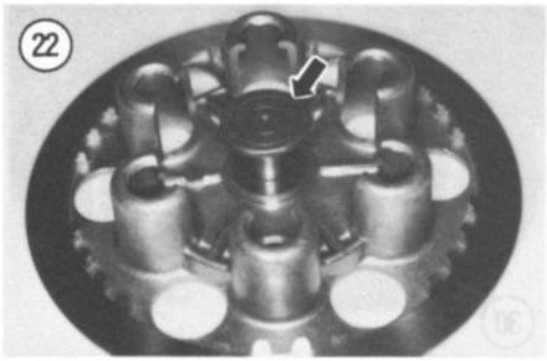


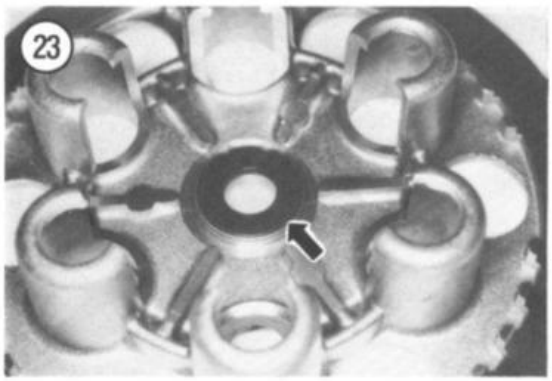


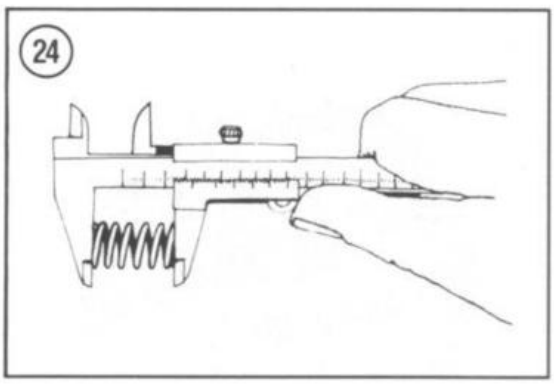


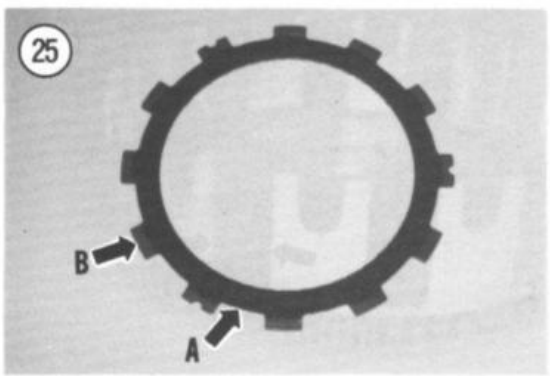












Inspection

Clutch service specifications and wear limits are listed in **Table 1**.

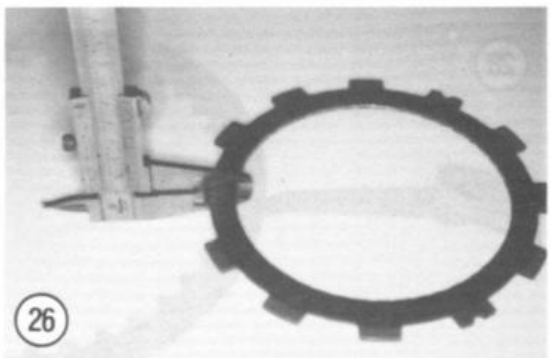
1. Remove the release rack (**Figure 22**) and bearing (**Figure 23**) from the pressure plate.

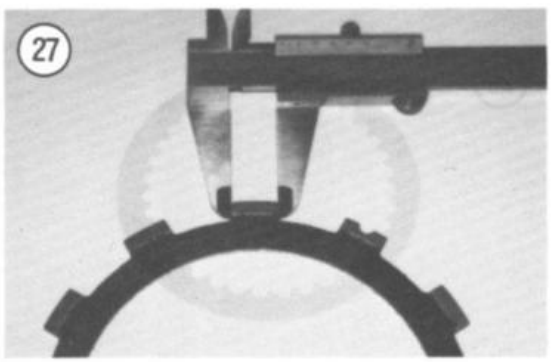
2. Clean all parts in solvent and thoroughly dry with compressed air.

3. Measure the free length of each clutch spring (**Figure 24**) with a vernier caliper. Compare to specification listed in **Table 1** and replace the springs as a set if any one spring has sagged to become too short.

4. **Table 1** lists the number of stock friction plates. The friction material is made of cork (A, **Figure 25**) that is bonded onto an aluminum plate for warp resistance and durability. Measure the thickness of each friction plate at several places around the disc (**Figure 26**) with a micrometer or vernier caliper. Replace all friction plates if any one is found worn to the service limit or less as listed in **Table 1**. Do not replace only 1 or 2 plates.

5. Measure the width of the friction plate claw width with a vernier caliper (**Figure 27**). Replace all friction plates if any one is found worn to the service





limit listed in **Table 1**. Do not replace only 1 or 2 plates.

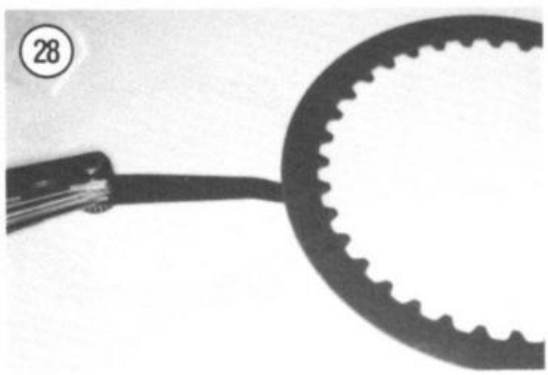
6. **Table 1** lists the number of stock clutch metal plates. Place each clutch metal plate on a surface plate or a thick piece of plate glass and check for warpage with a feeler gauge (**Figure 28**). If any plate is warped more than specified in **Table 1**, replace the entire set of plates. Do not replace only 1 or 2 plates.

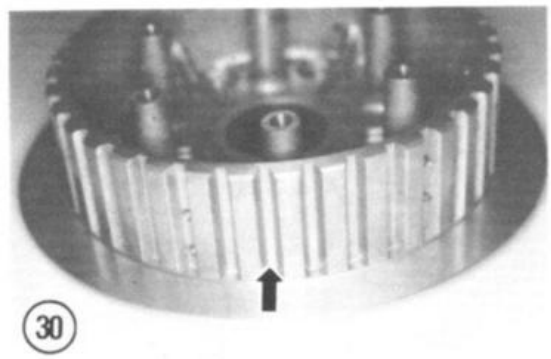
7. The clutch metal plate inner teeth (**Figure 29**) mesh with the clutch hub splines (**Figure 30**). Check the splines for cracks or galling. They must be smooth for chatter-free clutch operation. If the clutch hub splines (**Figure 30**) are worn, also check the clutch metal plate teeth for wear or damage.

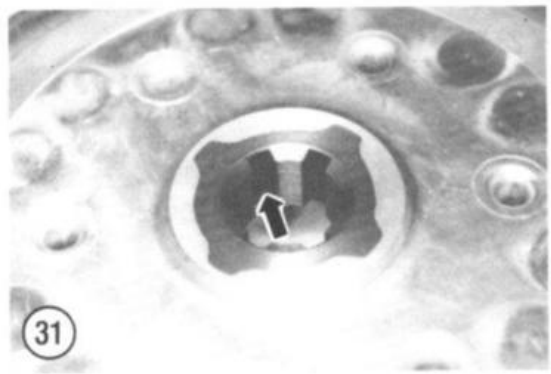
8. Inspect the shaft splines (**Figure 31**) in the clutch hub. If damage is only a slight amount, remove any small burrs with a fine cut file. If damage is severe, replace the clutch boss assembly.

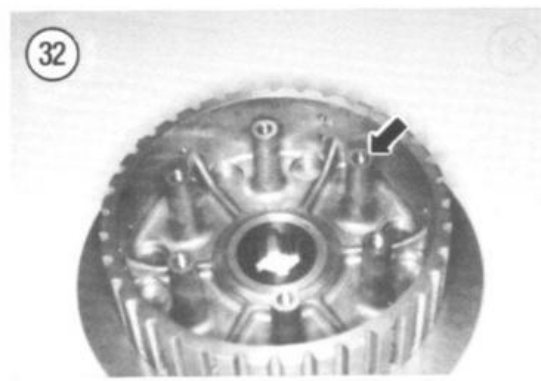
9. Inspect the clutch hubs 6 bolt studs (**Figure 32**) for thread damage or cracks at the base of the studs. Thread damage may be repaired with the correct size metric tap. Use kerosene on the tap threads. If a bolt stud is cracked, the clutch boss must be replaced.

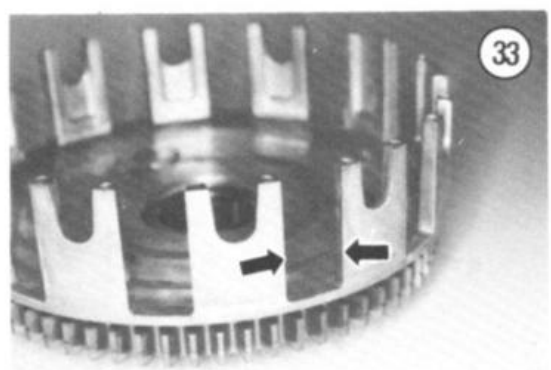
10. The friction plates have claws (B, **Figure 25**) that slide in the clutch housing grooves (**Figure 33**).







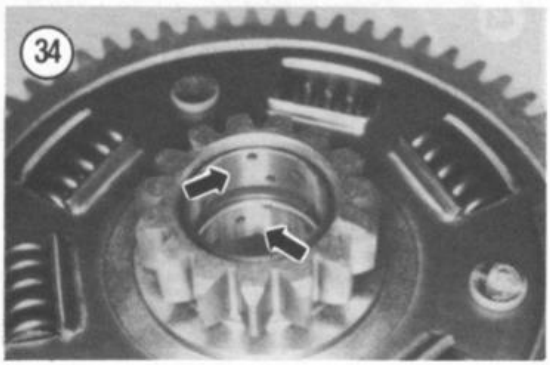


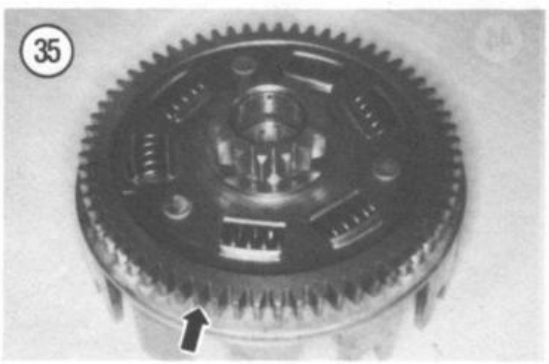


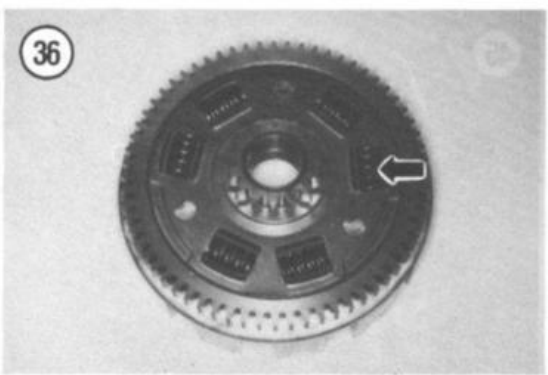
Inspect the claws for cracks or galling in the grooves. The claws must be smooth for chatter-free clutch operation. Light damage can be repaired with an oilstone. Replace the clutch housing if damaged is severe.

11. Check the clutch housing bearing bore (**Figure 34**) for cracks, deep scoring, excessive wear or heat discoloration. If the bearing bore is damaged, also check the clutch housing spacer for damage. Replace worn or damaged parts.

12. Check the clutch housing gear teeth (**Figure 35**) for tooth wear, damage or cracks. Replace the clutch housing if necessary.







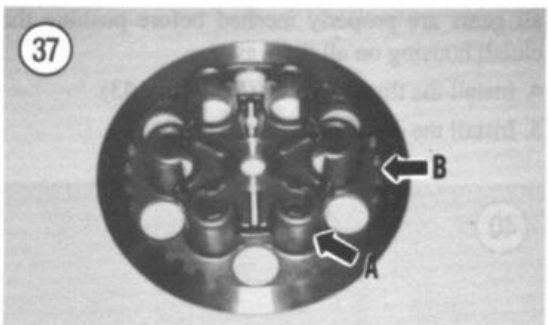
NOTE

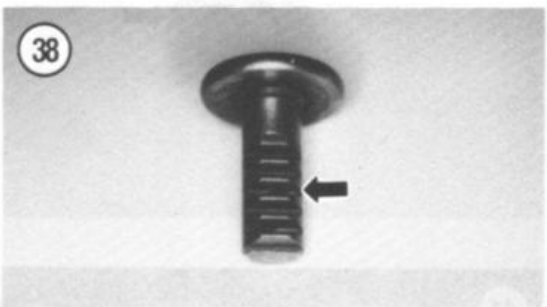
If the clutch housing gear teeth are damaged, the gear teeth on the primary drive gear and the kickstarter idler gear may also be damaged; inspect them also.

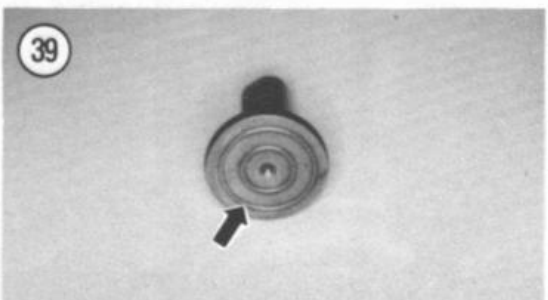
13. Check the damper springs (**Figure 36**) in the clutch housing for damage or breakage. If any of the springs are damaged or have sagged, replace the clutch housing.

14. Check the pressure plate spring towers (A, **Figure 37**) and splines (B, **Figure 37**) for cracks at the base of the tower.

15. Inspect the clutch release rack (**Figure 38**) and the surface that rides against the bearing (**Figure 39**) for wear or damage. Replace if necessary.







16. Inspect the clutch release rack bearing (**Figure 40**) for wear or damage. Replace if necessary.

17. If there is any doubt as to the condition of any clutch part, replace it with a new one.

18. Install the bearing (**Figure 23**) and the release rack (**Figure 22**) into the pressure plate.

Assembly

Refer to **Figure 11** for this procedure.

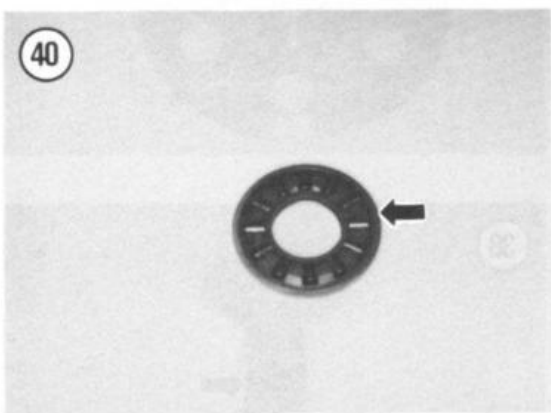
1. Coat all clutch parts with clean engine oil before reassembly.

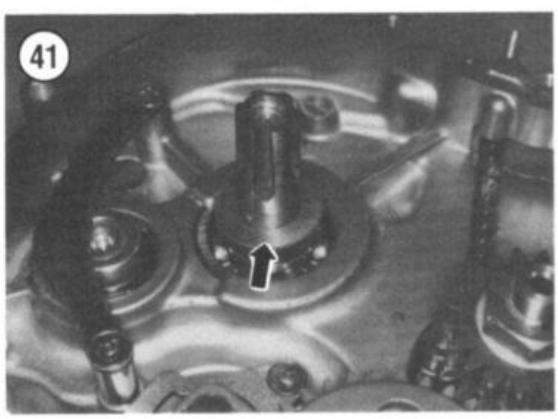
2. Install the washer (**Figure 41**) and spacer (**Figure 42**).

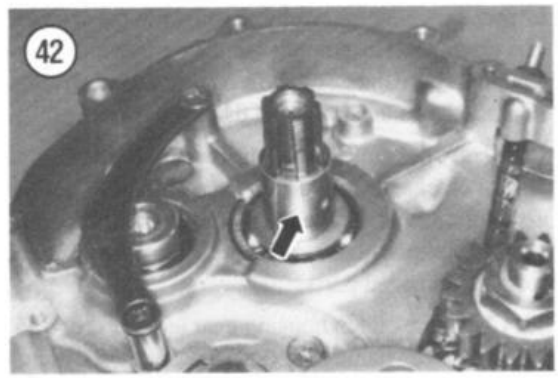
3. Install the clutch housing (A, **Figure 43**). Turn the kickstarter idle gear and primary drive gear (**Figure 44**) while installing the clutch housing. Make sure all gears are properly meshed before pushing the clutch housing on all the way.

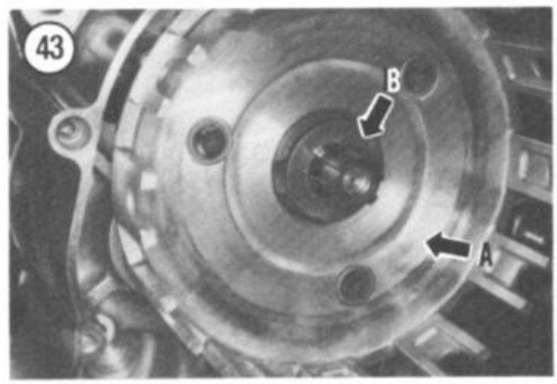
4. Install the thrust washer (B, **Figure 43**).

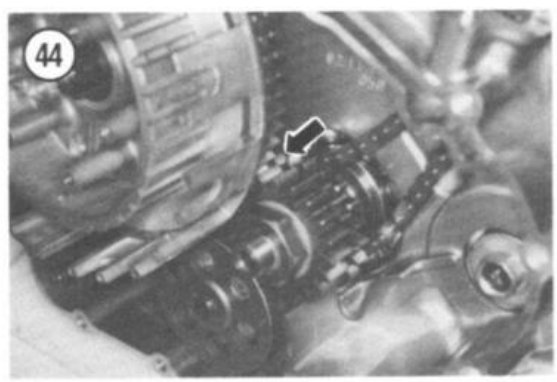
5. Install the clutch hub (**Figure 45**).

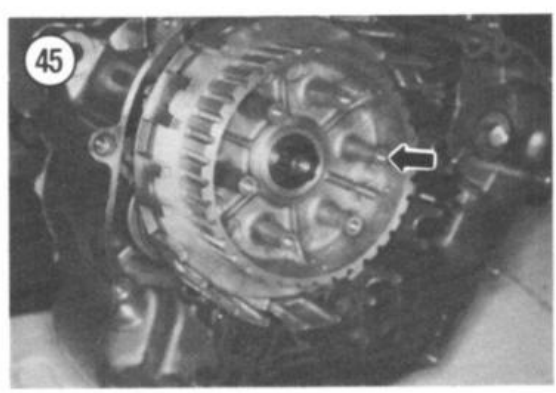


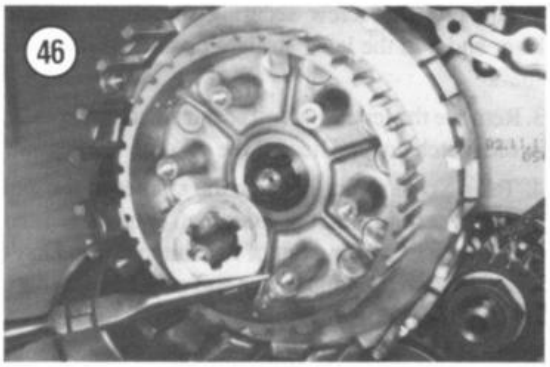


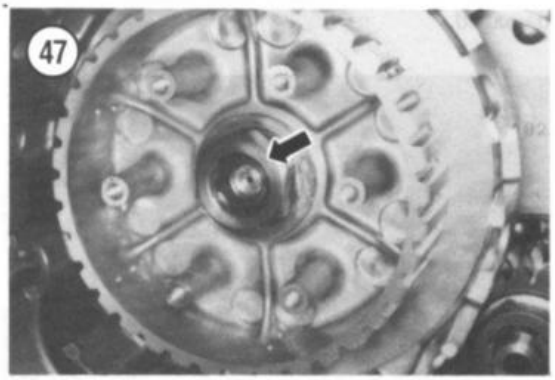


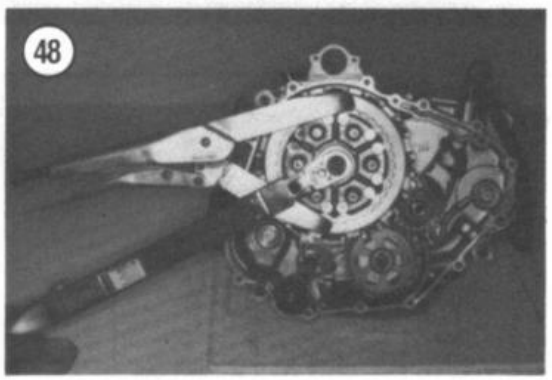


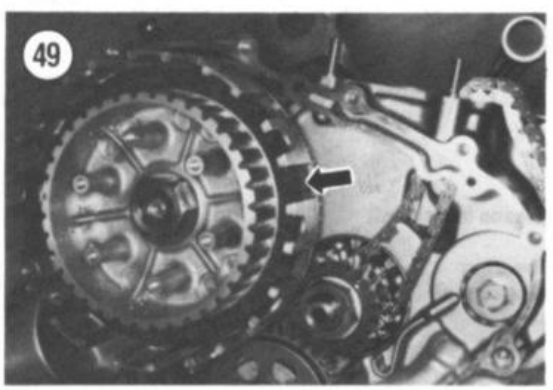












NOTE

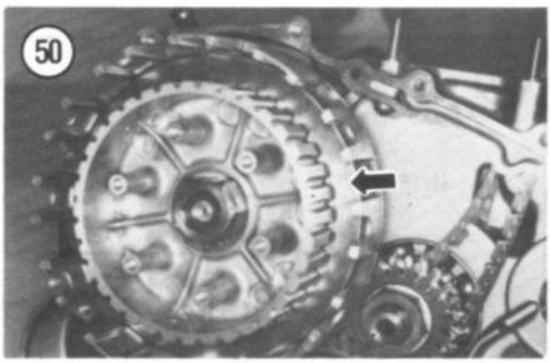
Install a new lockwasher if the old one has been removed 2 times.

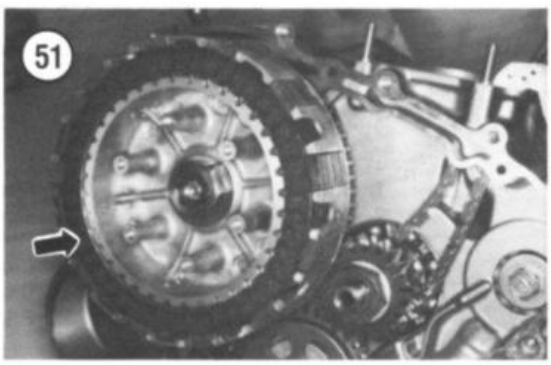
6. Install the lockwasher (**Figure 46**).
7. Install the clutch nut (**Figure 47**) and secure the clutch boss with the same tool used during removal. Tighten the clutch nut (**Figure 48**) to the torque specification in **Table 2**.

CAUTION

If either or both friction discs and/or clutch plates have been replaced with new ones or if they were cleaned, apply new engine oil to all surfaces to avoid damaging the plates or having the clutch lock up when used for the first time.

8. Install the friction plates and clutch plates onto the clutch hub as follows:
   a. First install one of the friction plates (**Figure 49**).
   b. Install a clutch plate (**Figure 50**).
   c. Continue to install the friction plate and then a clutch plate, alternating them until all are installed. The last item installed is a friction plate (**Figure 51**).





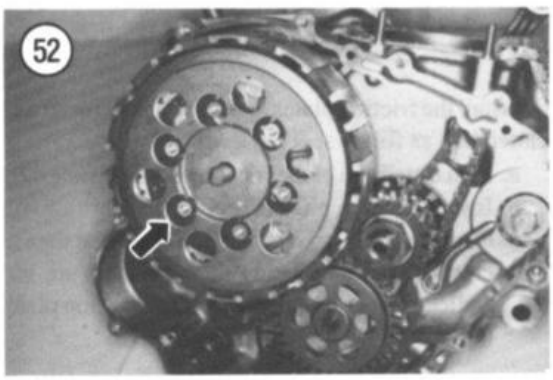
9. Install the pressure plate (**Figure 52**).
10. Install the clutch springs (**Figure 53**) and bolts. Securely tighten the bolts in a crisscross pattern.
11. Install the clutch cover as described in this chapter.

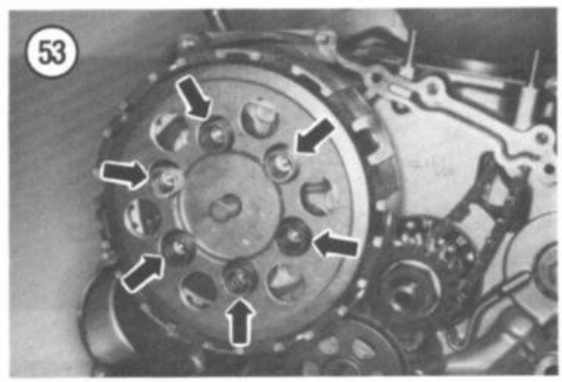
CLUTCH RELEASE MECHANISM

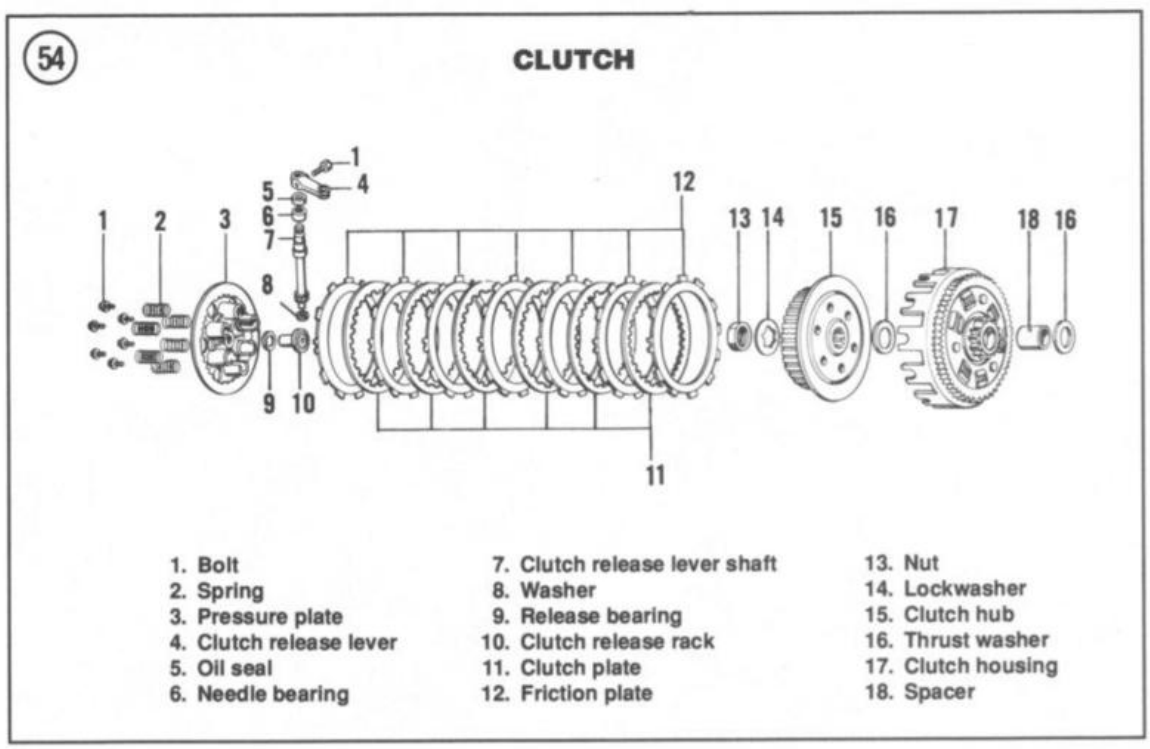
Removal/Installation

Refer to **Figure 54** for this procedure.

1. Remove the clutch cover as described in this chapter.
2. Remove the screw securing the clutch release lever and pull the lever straight up and off the lever shaft.
3. Remove the lever shaft oil seal from the receptacle in the clutch cover. Discard the oil seal.
4. Taking care to not damage the splines at the end of the lever shaft, pull the lever shaft (**Figure 55**) and needle bearing up and out of the clutch cover. Don't lose the washer on the lower end of the lever shaft. Discard the needle bearing.
5. Check the lever shaft for any signs of wear, cracks or breakage. Replace the lever shaft if worn or damaged.





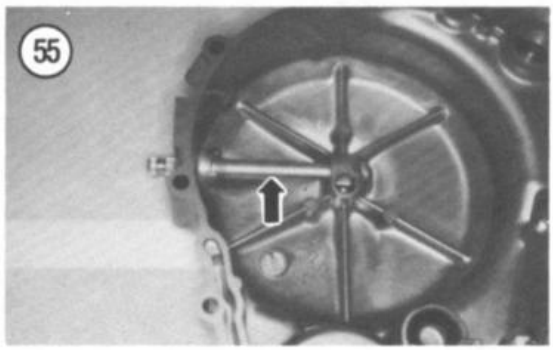


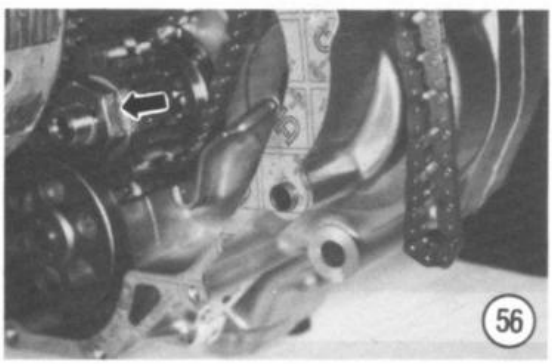
6. Install by reversing these removal steps while noting the following:
   a. Install the lever shaft and washer into the clutch cover until it bottoms out.
   b. Install a new needle bearing and new oil seal.

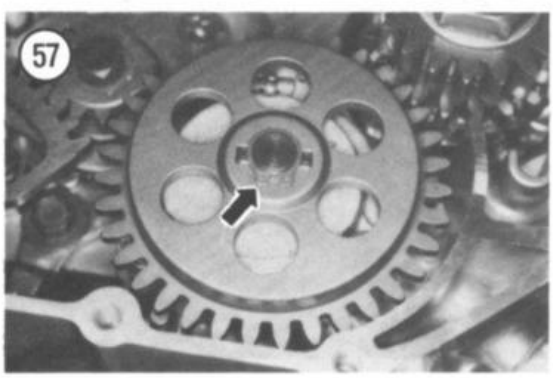
PRIMARY DRIVE GEAR AND OIL PUMP DRIVE GEAR

Removal

1. Remove the clutch cover as described in this chapter.





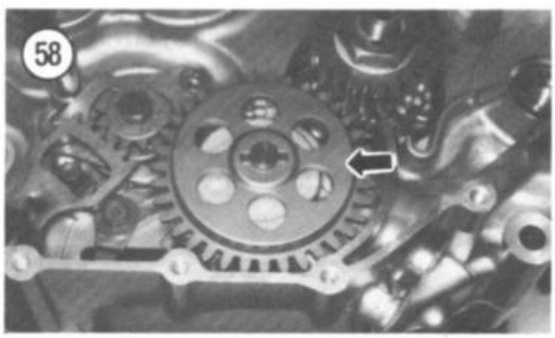


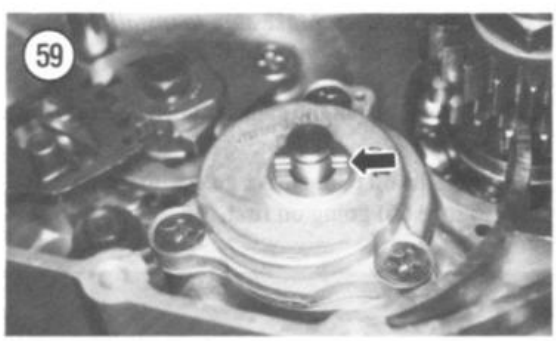
2. Place a soft copper or brass washer between the gear teeth of the primary drive gear and the clutch outer housing gear.

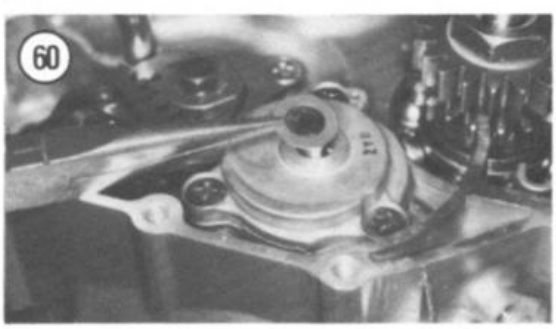
CAUTION

*The primary drive gear has **left-hand threads**. Turn the wrench **clockwise** when loosening the nut.*

3. Turning the wrench *clockwise*, loosen the nut (**Figure 56**) securing the primary drive gear to the crankshaft. Remove the copper or brass washer.
4. Remove the clutch as described in this chapter.
5. Remove the circlip (**Figure 57**) securing the oil pump driven gear and remove the gear (**Figure 58**).
6. Remove the dowel pin (**Figure 59**) and washer (**Figure 60**) from the oil pump drive shaft. Place







the dowel pin and drive gear into a reclosable plastic bag to avoid misplacing them.

7. Remove the primary drive gear nut (**Figure 61**) and the lockwasher (**Figure 62**).

8. Remove the primary drive gear (**Figure 63**).

9. Remove the oil pump drive gear (A, **Figure 64**) and key (B, **Figure 64**) from the crankshaft.

10. If necessary, remove the camshaft drive chain (**Figure 65**) from the timing sprocket on the crankshaft.

11. Inspect all parts as described in this chapter.

Inspection

1. Clean all of the parts in solvent and thoroughly dry.

2. When the parts have been cleaned and are dry, visually inspect them for any signs of wear, cracks, breakage or other damage.

3. Check the gear teeth on the primary drive gear and the oil pump driven gear for wear or damage. Replace the gear if necessary.

4. Inspect the key way in the primary drive gear for wear or damage. Replace the gear if necessary.

Installation

NOTE

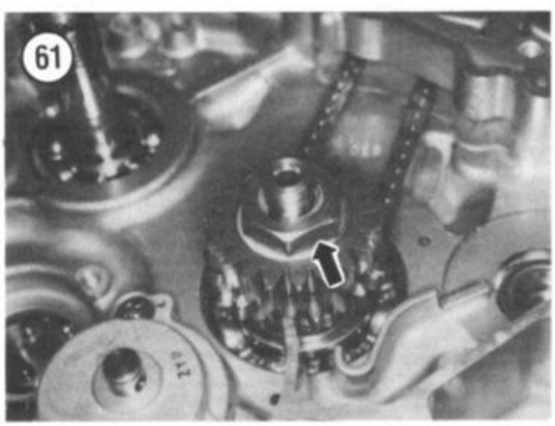
Nearly all of the following components are machined with a key way for alignment purposes. Make sure to install the parts correctly onto the shaft.

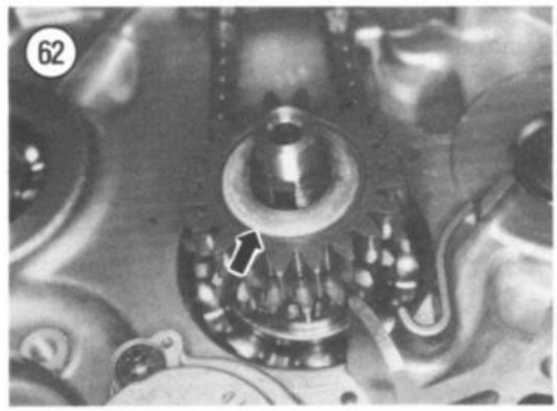
1. If removed, install the camshaft drive chain (**Figure 65**).

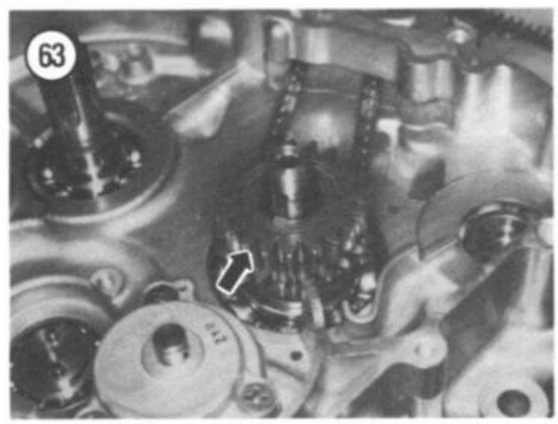
2. Position the oil pump drive gear with the recessed side (**Figure 66**) going on first.

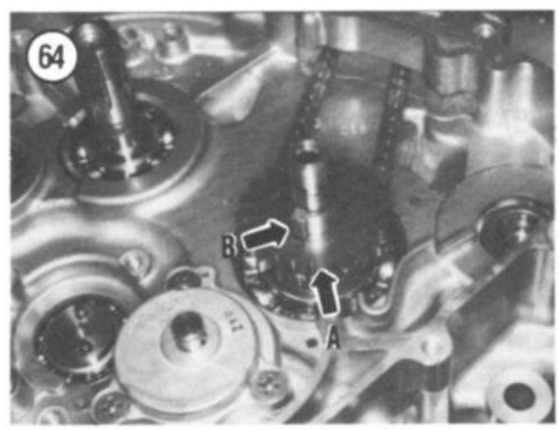
3. Install the oil pump drive gear (A, **Figure 64**) then install the key (B, **Figure 64**) into the groove in the crankshaft. Make sure the key is pushed down until it bottoms out.

4. Align the slot in the primary drive gear with the key way in the crankshaft and install the primary drive gear (**Figure 63**).





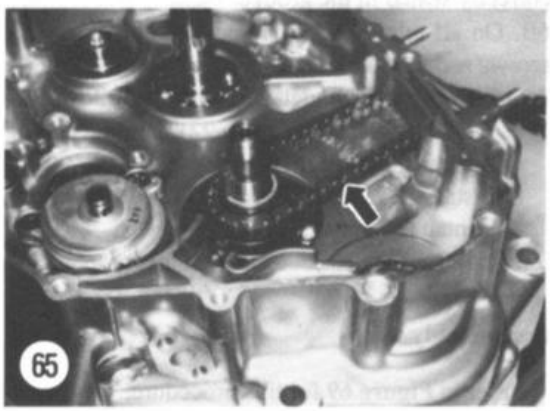


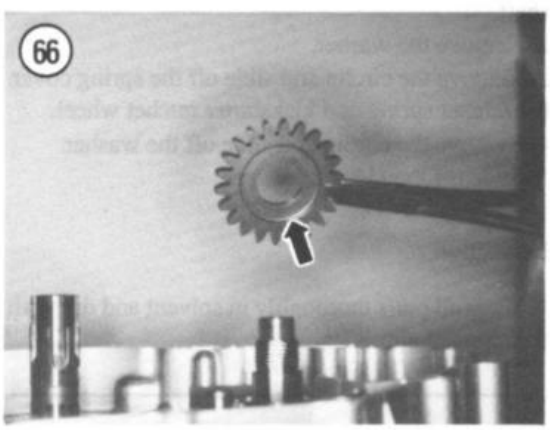


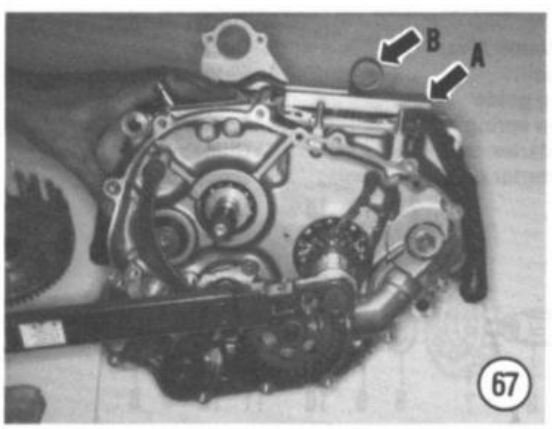
5. Install the lockwasher (**Figure 62**) and the nut (**Figure 61**).

NOTE

There are two different ways to keep the crankshaft from rotating while tightening the primary drive gear nut. These are presented in the following steps and they depend on what stage of disassembly the engine is in at the present time.







6A. If the cylinder and piston are removed from the engine, place a piston holding fixture (A, **Figure 67**) under the connecting rod (B, **Figure 67**) to hold the rod and prevent the crankshaft from rotating.

6B. If only the primary drive gear and clutch have been removed, perform the following:

a. Install the clutch as described in this chapter.
b. Place a soft copper or brass washer (A, **Figure 68**) between the gear teeth of the primary drive gear and the clutch outer housing gear to keep the crankshaft from rotating.

CAUTION

*The primary drive gear has **left-hand threads.** Turn the wrench **counterclockwise** to tighten the nut.*

7. Turning the wrench *counterclockwise*, tighten the nut (B, **Figure 68**) to the torque listed in **Table 2**. If used, remove the brass washer from between the gear teeth.
8. Install the clutch cover as described in this chapter.

KICKSTARTER

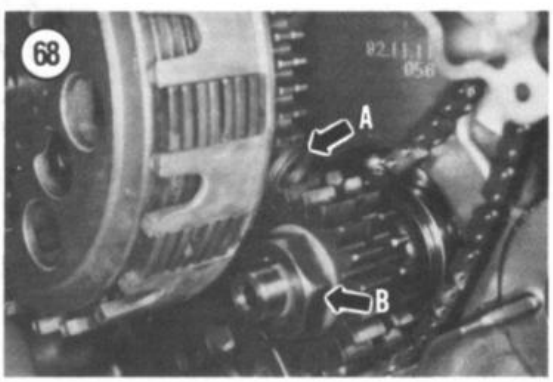
NOTE

Models equipped with an electric starter system are not equipped with a kickstarter assembly. When splitting the crankcases, refer to Step 7 under Removal and Installation.

Removal

Refer to **Figure 69** for this procedure.

1. Remove the clutch as described in this chapter.



2A. On models so equipped, remove the circlip securing the kickstarter idle gear.

2B. On all other models, remove the screws securing the retainer (A, **Figure 70**).

3. Remove the kickstarter idle gear (B, **Figure 70**).

4. Using a pair of needlenose or vise-grip pliers, remove the kickstarter return spring from its post position in the crankcase.

5. Release the spring and allow it to relax. Then rotate the kickstarter assembly *counterclockwise* by hand and remove it from the crankcase.

NOTE

There is a washer on the end of the kickstarter shaft, don't lose it during removal.

6. If necessary, disassemble the kickstarter shaft assembly and service it as described in this chapter.

7. On electric start models, perform the following:
   a. Remove the screws securing the retainer (**Figure 71**) and remove the retainer.
   b. Remove the spacer (**Figure 72**) from the end of the transmission shaft.

Installation

1. Apply a small amount of cold grease to the washer and install it onto the end of the kickstarter shaft.

2. Install the kickstarter into the crankcase.

3. Slightly rotate the kickstarter *clockwise* and engage the pawl of the kickstarter ratchet with the guide in the crankcase.

4. Using needlenose or vise-grip pliers, rotate the return spring *clockwise* and hook the return spring onto the spring post in the crankcase. Make sure it is correctly positioned in the groove in the spring post.

5. Install the kickstarter idle gear.

6A. On models so equipped, install the circlip securing the kickstarter idle gear. Make sure the circlip is correctly seated in the groove.

6B. On all other models, remove the retainer and screws and tighten securely.

7. On electric start models, perform the following:
   a. Install the spacer (**Figure 72**) onto the end of the transmission shaft.
   b. Install the retainer (**Figure 71**) and screws and tighten securely.

8. Install the clutch as described in this chapter.

Disassembly

Refer to **Figure 69** for this procedure.

1. Remove the guide and return spring from the shaft.

2. Remove the washer.

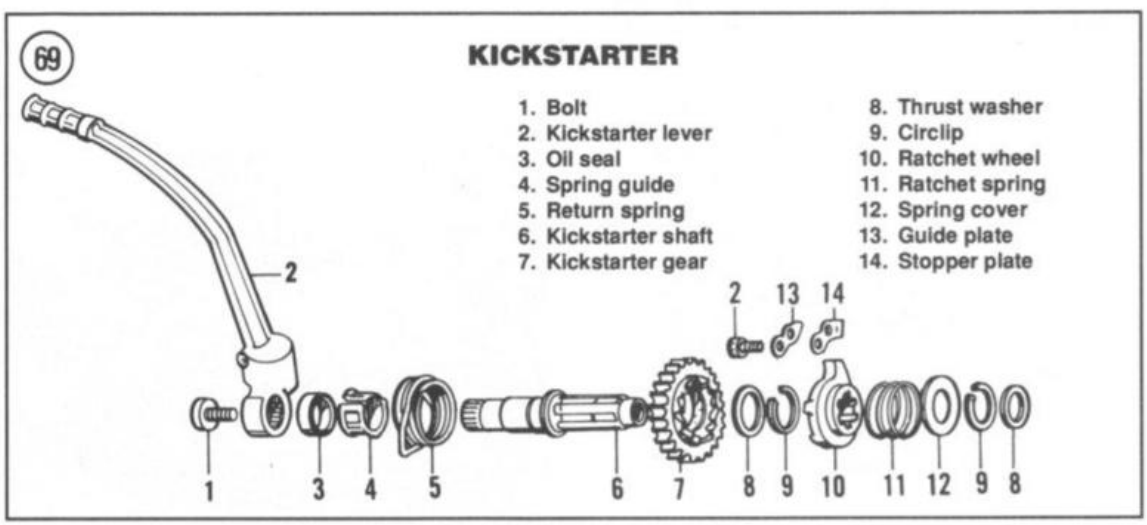
3. Remove the circlip and slide off the spring cover, the ratchet spring and kickstarter ratchet wheel.

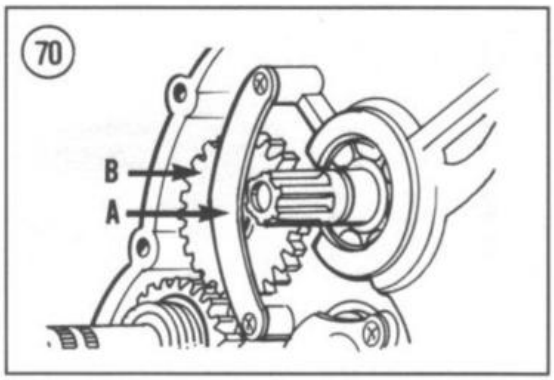
4. Remove the circlip and slide off the washer.

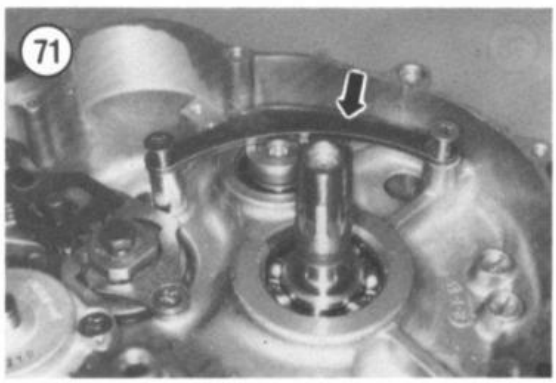
5. Slide off the kickstarter gear.

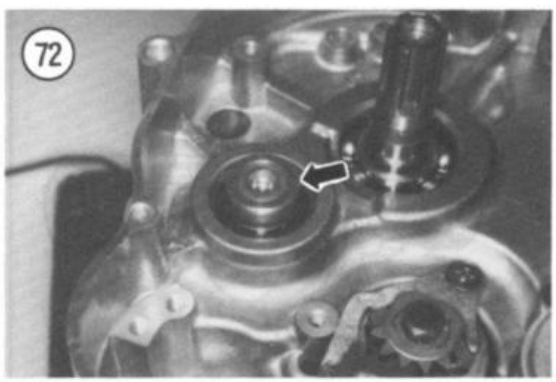
Inspection

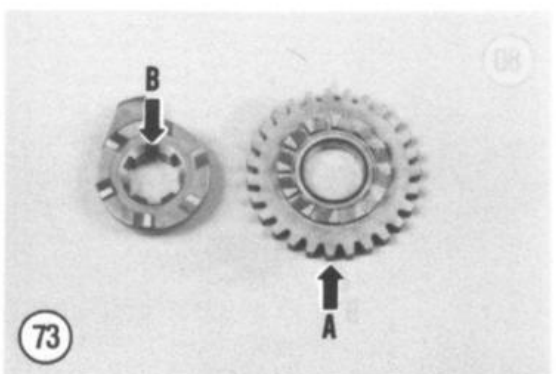
1. Wash all parts thoroughly in solvent and dry with compressed air.











2. Check for broken, chipped, or missing teeth on the kickstarter gear (A, **Figure 73**) and idle gear (**Figure 74**). If either part is damaged, replace the kickstarter gear and idle gear as a set.

3. Inspect the inner splines (B, **Figure 73**) of the kickstarter ratchet for wear or damage. Replace as necessary.

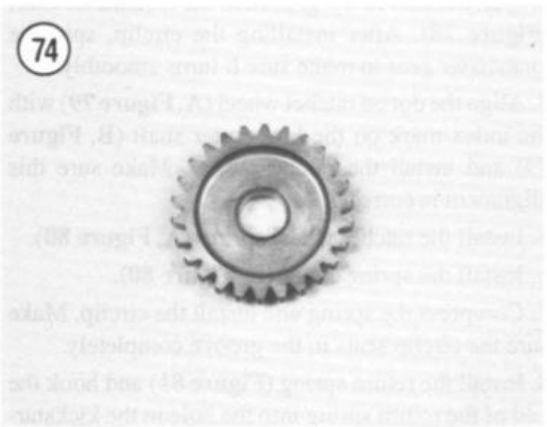
4. Inspect the ratchet surfaces (**Figure 75**) on both the kickstarter ratchet and the kickstarter gears. If either part is worn or damaged, replace both as a set.

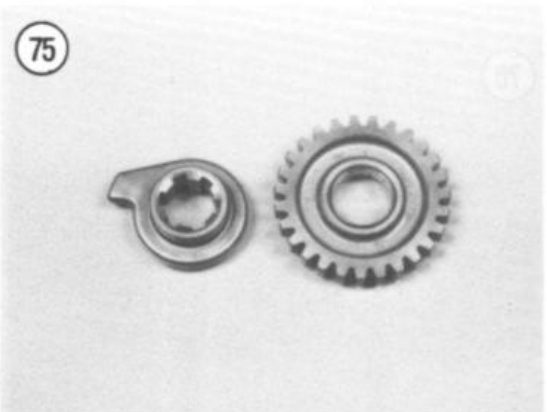
5. Inspect the kickstarter shaft as follows:

   a. Check the kickstarter lever splines for damage that would allow the lever to slip when the kickstarter is used.

   b. Check the shaft surface for cracks, deep scoring or other damage.

   c. Check the return spring hole in the shaft for cracks, wallowing or other conditions that would allow the spring to slip out when using the kickstarter.





d. Install the kick gear onto the shaft and check that the gear operates smoothly on the shaft. Check the shaft splines (**Figure 76**) for cracks or other damage.

e. Replace the kickstarter shaft if necessary.

6. Check the return spring for cracks, breakage or other damage. Replace if necessary.

7. Inspect all parts for uneven wear; replace any that are questionable.

Assembly

Refer to **Figure 69** for this procedure.

1. Apply assembly oil to the sliding surfaces of all parts.

2. Install the kickstarter gear (A, **Figure 77**) so that the ratchet teeth go on last.

3A. On models so equipped, install the wave washer (B, **Figure 77**).

3B. On all models, install the washer (C, **Figure 77**) and circlip (D, **Figure 77**). Make sure the circlip is properly seated in the groove in the kickstarter shaft (**Figure 78**). After installing the circlip, spin the kickstarter gear to make sure it turns smoothly.

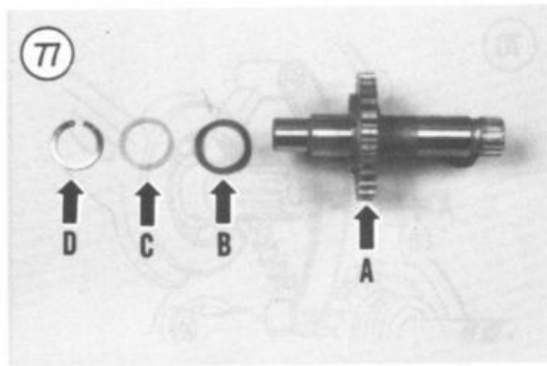
4. Align the dot on ratchet wheel (A, **Figure 79**) with the index mark on the kickstarter shaft (B, **Figure 79**) and install the ratchet wheel. Make sure this alignment is correct.

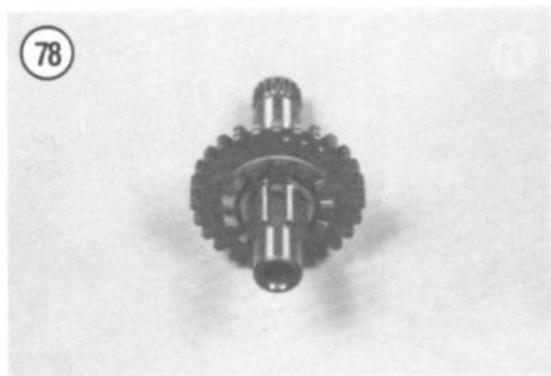
5. Install the ratchet wheel spring (A, **Figure 80**).

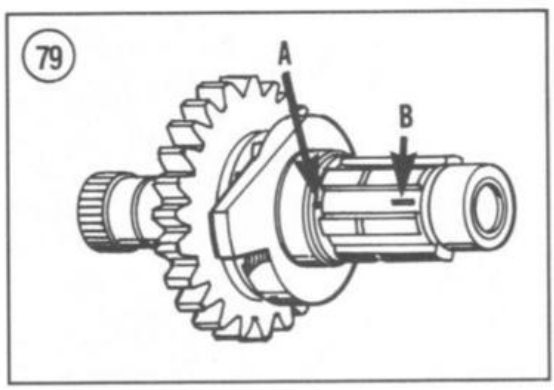
6. Install the spring cover (B, **Figure 80**).

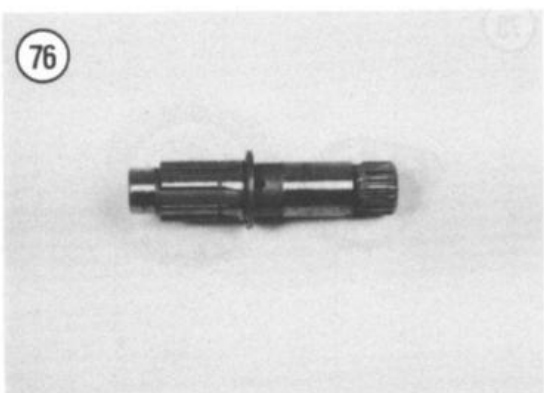
7. Compress the spring and install the circlip. Make sure the circlip seats in the groove completely.

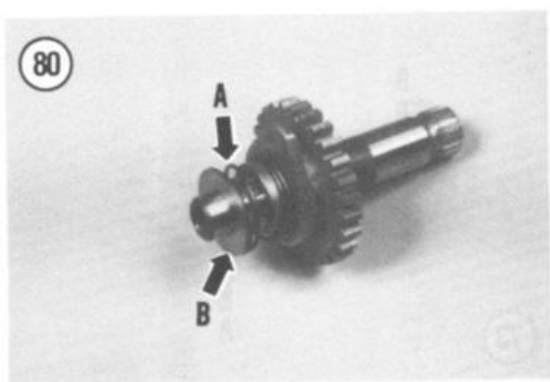
8. Install the return spring (**Figure 81**) and hook the end of the return spring into the hole in the kickstarter shaft.

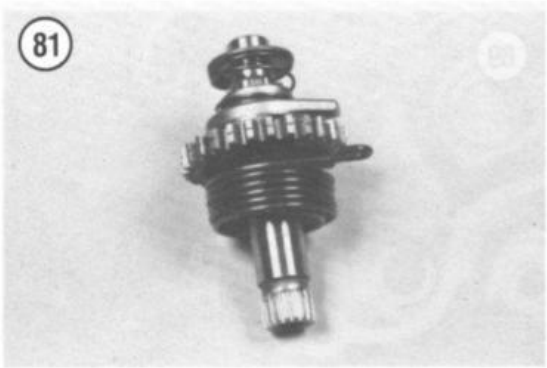


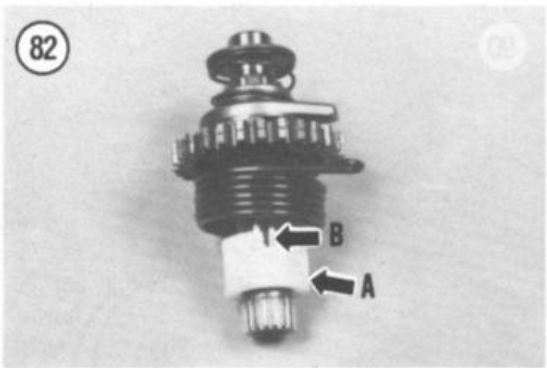


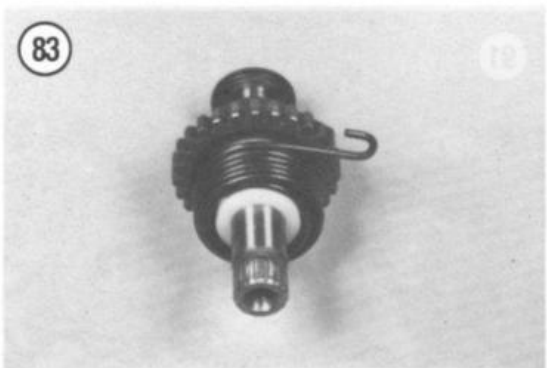


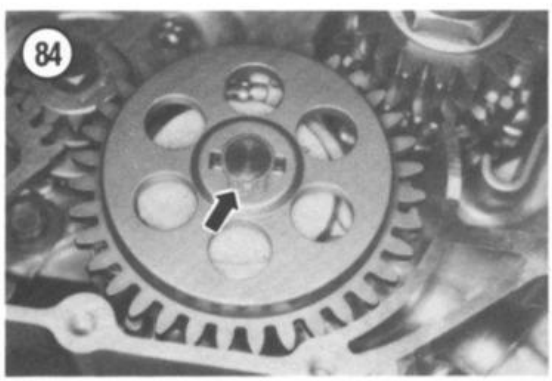












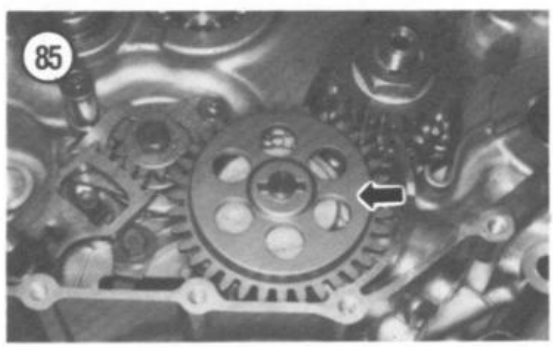
9. Slide the spring guide (A, **Figure 82**) onto the kickstarter shaft and into the spring. Make sure the notch (B, **Figure 82**) in the spring guide fits around the inner end of the return spring.
10. Press the spring guide in until it bottoms out (**Figure 83**).
11. Apply a light coat of cold grease to the washer to keep the washer in place on the shaft and install the washer.

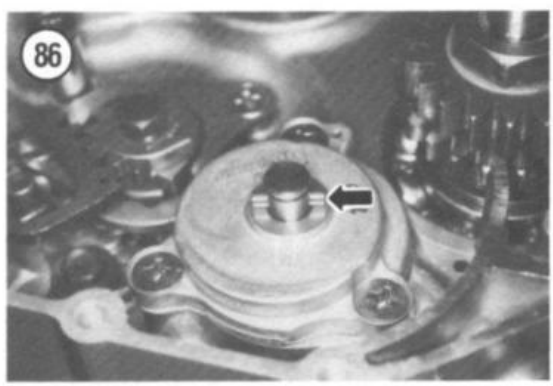
EXTERNAL SHIFT MECHANISM

The external shift mechanism is located on the same side of the crankcase as the clutch assembly. To remove the shift drum and shift forks it is necessary to split the crankcases as described in Chapter Five.

Removal

1. Remove the clutch assembly as described in this chapter.
2. Remove the circlip (**Figure 84**) securing the oil pump drive gear and remove the gear (**Figure 85**).
3. Remove the dowel pin (**Figure 86**) from the oil pump driven shaft. Place the dowel pin and drive





gear into a reclosable plastic bag to avoid misplacing them.

4. Withdraw the gearshift shaft assembly (**Figure 87**) from the crankcase.

5. First unhook the spring (**Figure 88**) from the post on the crankcase then from the shift drum stopper. Remove the spring.

6. Remove the bolt (A, **Figure 89**) securing the shift drum stopper and remove the stopper assembly (B, **Figure 89**).

7. Remove the screws (**Figure 90**) securing the cam guide to the crankcase.

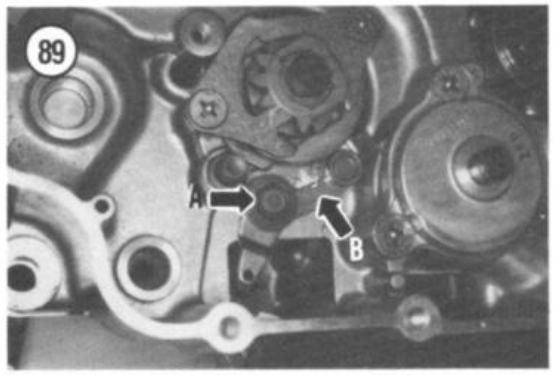
8. Remove the bolt (A, **Figure 91**) securing the cam gear assembly to the end of the shift drum.

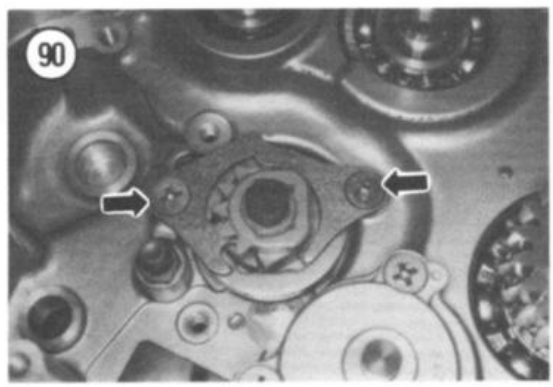
9. Remove the cam guide, cam gear and shift drum stopper plate assembly (B, **Figure 91**) from the crankcase.

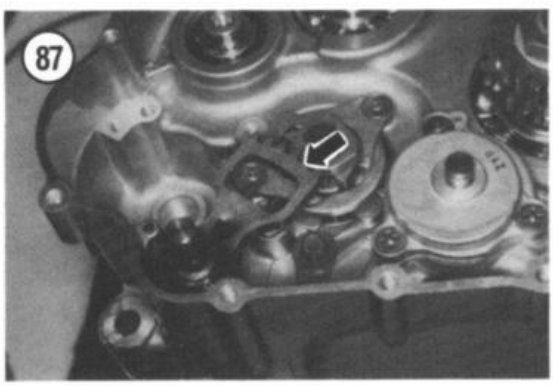
10. Remove the spacer (**Figure 92**) from the end of the shift drum.

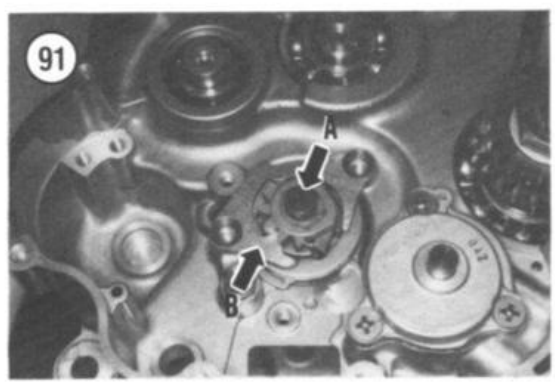
11. If necessary, disassemble the cam gear assembly as follows:

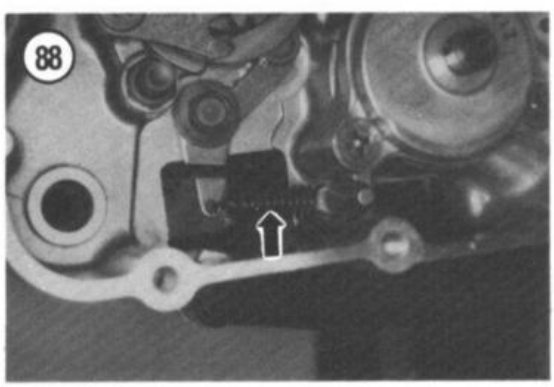
a. Perform this disassembly procedure on a work bench and within the confines of a tray with sides. The small pawls, pins and springs may

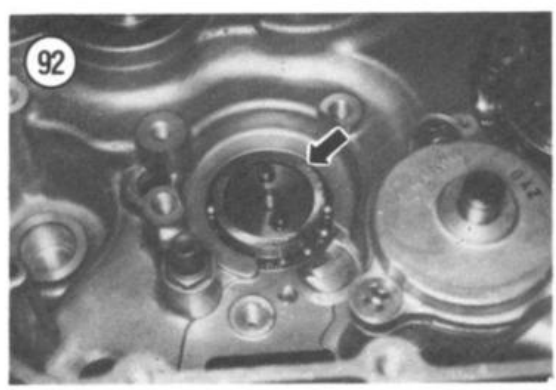








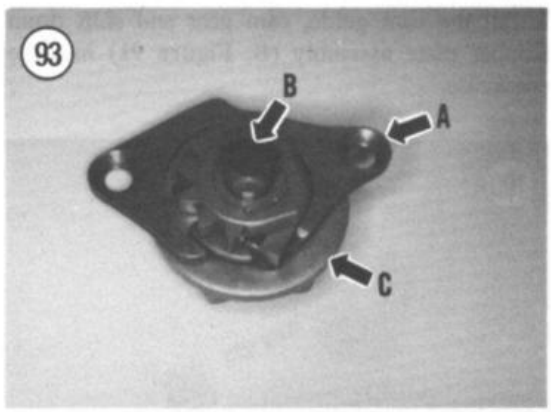




shoot out of the cam gear and may be easily lost.

b. Remove the cam guide (A, **Figure 93**) from the assembly.

c. Remove the cam gear assembly (B, **Figure 93**) from the shift drum stopper plate (C, **Figure 93**).



d. Remove the 2 sets of springs, pins and pawls from the cam gear.

12. Inspect all parts as described in this chapter.

Inspection

1. Make sure that the gearshift shaft (A, **Figure 94**) is not bent.

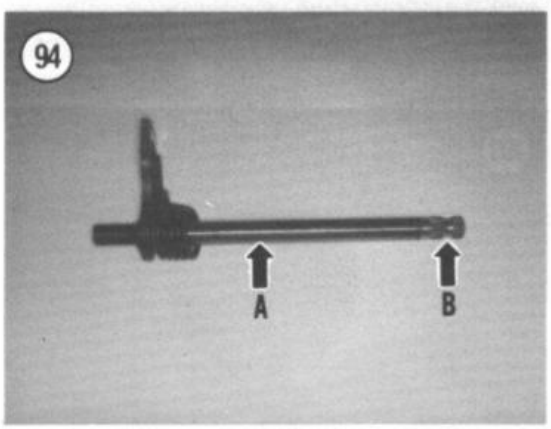
2. Place each shaft on V-blocks and check runout with a dial indicator. If runout exceeds 0.16 mm (0.0062 in.), replace the bent shaft.

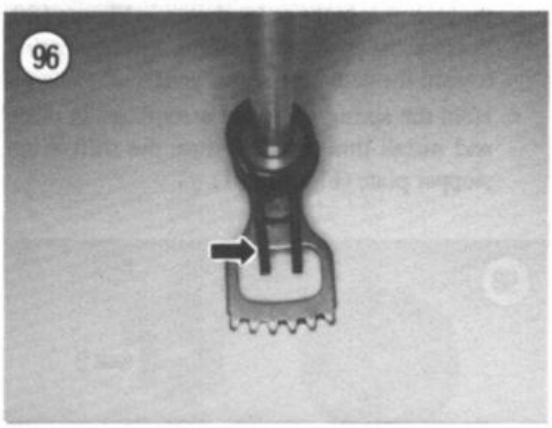
3. Inspect the splines (B, **Figure 94**) for wear or damage. Replace the shaft if necessary.

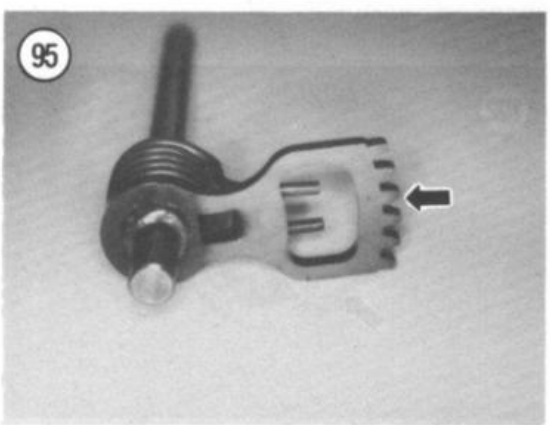
4. Check the engagement gear teeth (**Figure 95**) for wear or damage. Replace the shaft if necessary.

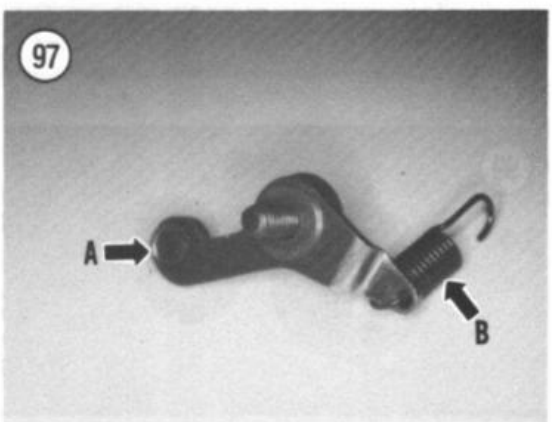
5. Check the return spring (**Figure 96**) on the shift lever assembly. Replace the return spring if it shows signs of fatigue or if it is cracked.

6. Inspect the shift drum stopper roller (A, **Figure 97**) and spring (B, **Figure 97**) for wear or damage. The roller must rotate freely with no signs of binding.









7. Inspect the ramps (A, **Figure 98**) on the shift drum stopper plate for wear or roughness. Replace if necessary.

8. Inspect the pawl receptacle (B, **Figure 98**) in the cam gear for wear or damage. Replace if necessary.

9. Inspect the opposite side of the shift drum stopper plate and the cam gear (**Figure 99**) for wear or damage. Replace if necessary.

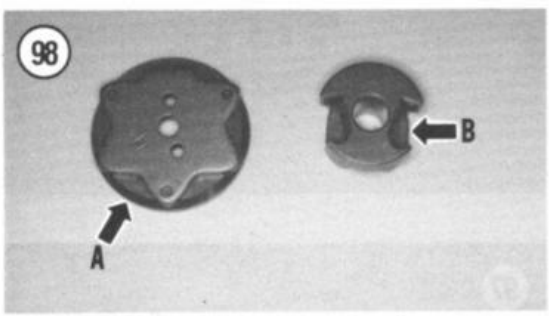
10. Inspect the cam gear assembly (**Figure 100**) for wear or damage. Replace as an assembly even if only one component is worn or damaged.

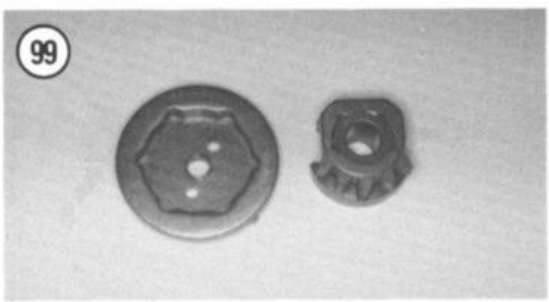
Installation

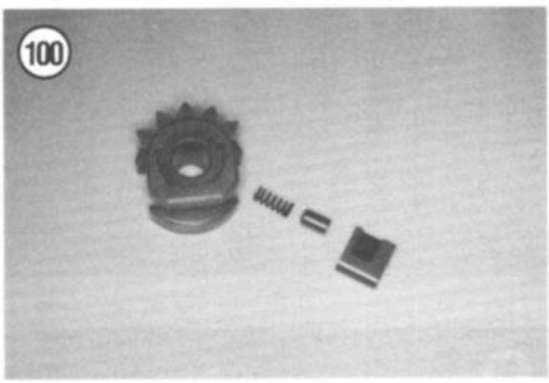
1. If disassembled, assemble the cam gear assembly as follows:
   a. Perform this assembly procedure on a work bench and within the confines of a tray with sides. The small pawls, pins and springs may shoot out during assembly.
   b. Install the 2 sets of springs, pins and pawls into the cam gear in the order shown in **Figure 100**. Position the pawl with the long shoulder facing toward the cam gear sector gear.
   c. Hold the spring and pawl assemblies in place and install this assembly into the shift drum stopper plate (**Figure 101**).
   d. Install the cam guide (**Figure 102**) onto these assembled components.

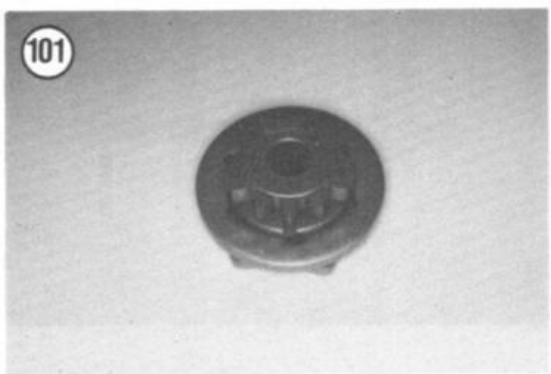
2. Install the spacer (**Figure 103**) onto the end of the shift drum (**Figure 92**).

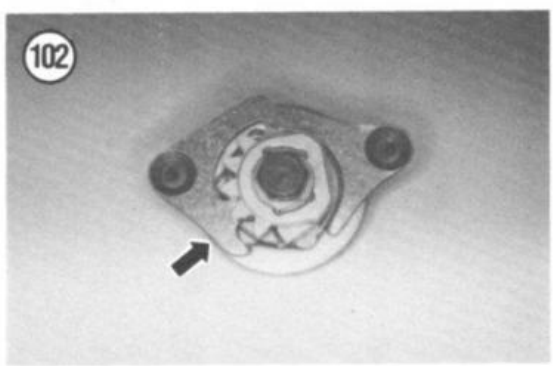
3. Align the 2 receptacles on the backside of the shift drum stopper plate (A, **Figure 104**) with the raised pins on the face of the shift drum (B, **Figure 104**). Install the cam guide, cam gear and shift drum stopper plate assembly (B, **Figure 91**) into the crankcase.





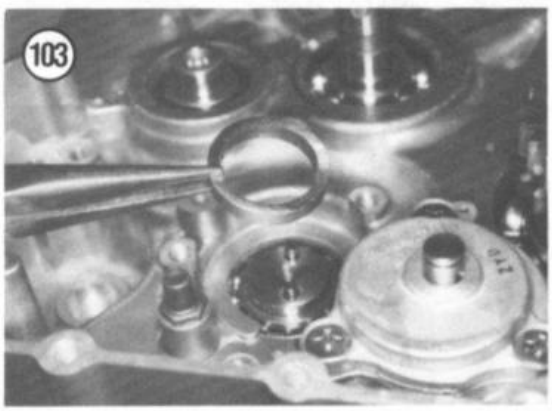


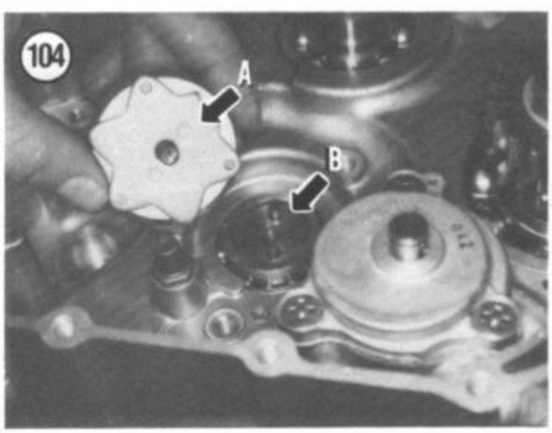


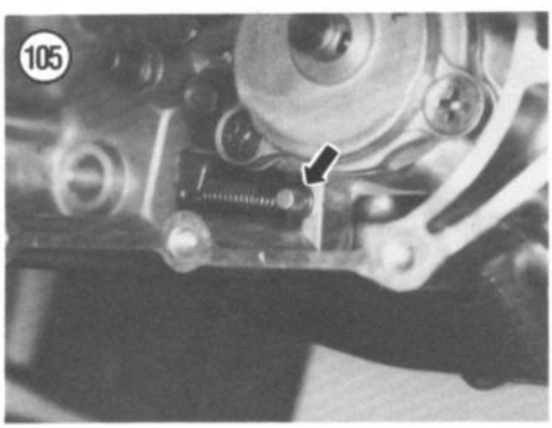


4. Apply red Loctite 271 to the bolt threads prior to installation. Install the bolt (A, **Figure 91**) securing the cam gear assembly to the end of the shift drum. Tighten the bolt to the specification listed in **Table 2**.

5. Install the screws (**Figure 90**) securing the cam guide to the crankcase and tighten securely.







6. Apply red Loctite (No. 241) to the bolt threads prior to installation. Install the shift drum stopper (B, **Figure 89**) and bolt (A, **Figure 89**) and tighten securely.

7. First hook the spring (**Figure 88**) onto the shift drum stopper and then onto the crankcase post (**Figure 105**). Make sure the spring is correctly attached.

8. Make sure the return spring is correctly positioned on the shaft assembly (**Figure 106**).

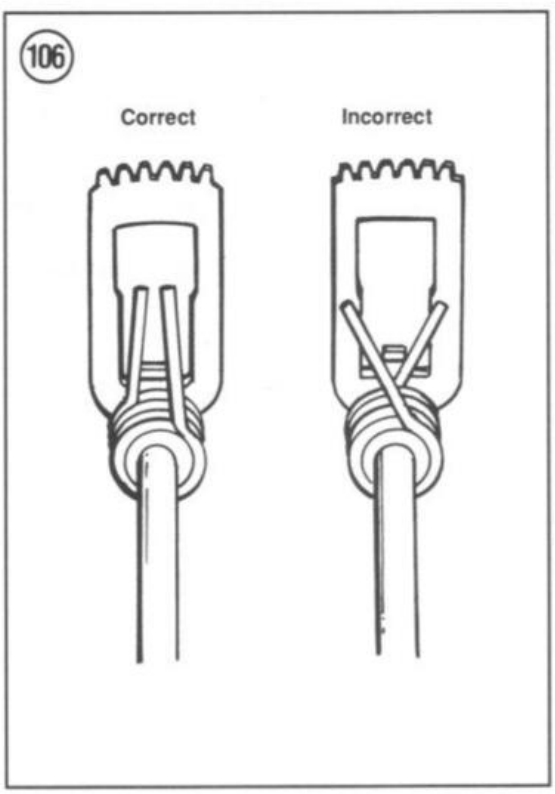
9. Install the gearshift shaft assembly (**Figure 87**) into the crankcase.

10. Center the sector gear on the gearshift shaft assembly (A, **Figure 107**) with the sector gear on the cam gear (B, **Figure 107**). This alignment is necessary for proper gear shift operation.

11. Install the dowel pin (**Figure 86**) into the oil pump driven shaft.

12. Install the oil pump driven gear (**Figure 85**) and secure it with the circlip (**Figure 84**). Make sure the circlip is properly seated in the oil pump shaft groove.

13. Install the clutch assembly as described in this chapter.



CLUTCH CABLE

Replacement

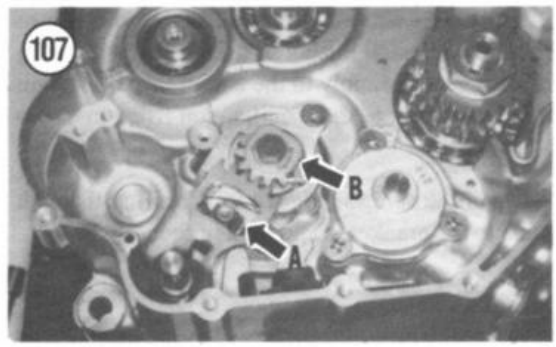
In time the clutch cable will stretch to the point that it is no longer useful and will have to be replaced.

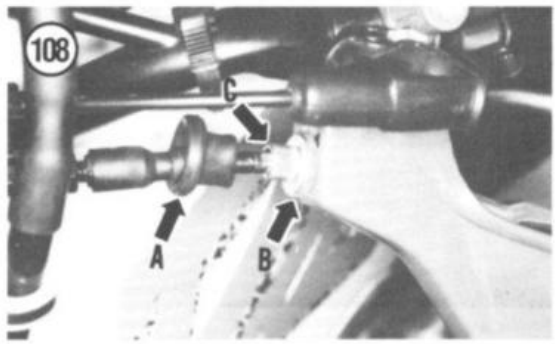
1. Remove the fuel tank as described in Chapter Eight.
2. Pull the protective boot (A, **Figure 108**) away from the clutch lever.
3. Loosen the locknut (B, **Figure 108**) and adjusting barrel (C, **Figure 108**) to allow maximum slack in the cable.
4. Slip the cable end out of the hand lever.
5. Disconnect the clutch cable (A, **Figure 109**) from the push lever.
6. Remove the clutch cable from the bracket (B, **Figure 109**) on the clutch cover.

NOTE

Prior to removing the cable make a drawing (or take a Polaroid picture) of the cable routing through the frame. It is very easy to forget its routing after it has been removed. Replace the cable exactly as it was, avoiding any sharp turns.

7. Pull the cable out of the retaining clip on the steering stem.
8. Remove the cable and replace it with a new one.
9. Install by reversing these removal steps while noting the following:
   a. Make sure it is correctly routed with no sharp turns.
   b. Adjust the clutch cable as described in Chapter Three.





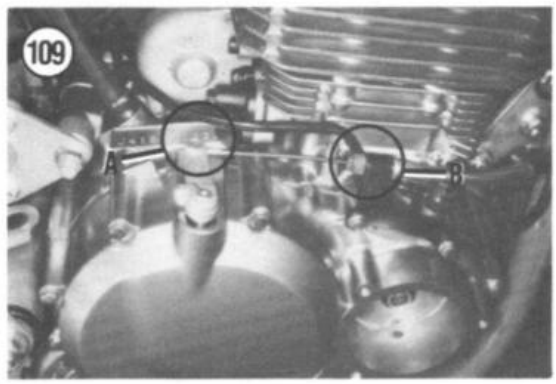


Table 1 CLUTCH SPECIFICATIONS

Item	Specification mm (in.)	Wear limit mm (in.)
Friction plate thickness		
Quantity 7		
Thickness	2.72-2.88 (0.107-0.113)	2.42 (0.095)
Claw width	15.8-16.0 (0.62-0.63)	15.2 (0.6)
Steel clutch plate		
Quantity 6		
Warp limit	—	0.10 (0.004)
Clutch spring free length	—	29.5 (1.16)

Table 2 CLUTCH TIGHTENING TORQUES

Item	N•m	ft.-lb.
Clutch nut	40-60	29-43.5
Primary drive gear nut	60-80	43.5-58
Cam gear assembly bolt	20-27	14.5-19.5

CHAPTER SEVEN

TRANSMISSION AND INTERNAL SHIFT MECHANISM

The transmission is a 5-speed unit. To gain access to the transmission and internal shift mechanism it is necessary to remove the engine and split the crankcase as described in Chapter Five. Once the crankcase has been split, removal of the transmission and shift drum and forks is a simple task of pulling the assemblies up and out of the crankcase. This procedure is covered in detail in Chapter Five.

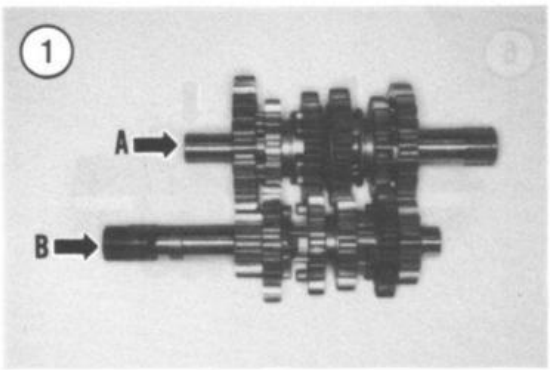
Transmission ratios are listed in **Table 1** and shift fork specifications are listed in **Table 2**. **Tables 1-2** are located at the end of the chapter.

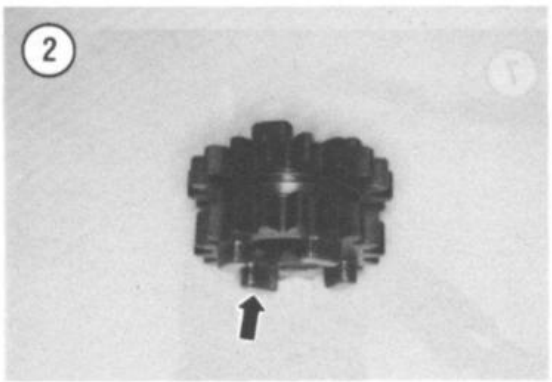
NOTE

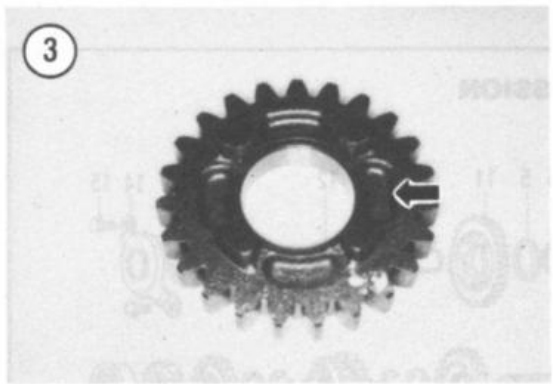
If disassembling a used, well run-in engine for the first time by yourself, pay particular attention to any additional shims that may have been added by a previous owner. These may have been added to take up the tolerance of worn components and must be reinstalled in the same position since the shims have developed a wear pattern. If new parts are going to be installed, these shims may be eliminated. This is something you will have to determine uponreassembly.

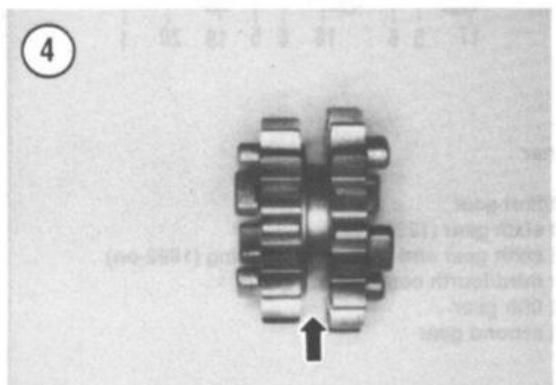
TRANSMISSION OPERATION

The basic transmission has 5 pairs of constantly meshed gears on the mainshaft (A, **Figure 1**) and countershaft (B, **Figure 1**). Each pair of meshed gears gives one gear ratio. In each pair, one of the gears is locked to its shaft and always turns with it. The other gear is not locked to its shaft and can spin freely on it. Next to each free spinning gear is a third gear which is splined to the same shaft, always turning with it. This third gear can slide from side to side along the shaft splines. The side of the sliding









gear and the free spinning gear have mating "dogs" (**Figure 2**) and "slots" (**Figure 3**). When the sliding gear moves up against the free spinning gear, the 2 gears are locked together, locking the free spinning gear to its shaft. Since both meshed mainshaft and countershaft gears are now locked to their shafts, power is transmitted at that gear ratio.

Shift Drum and Forks

Each sliding gear has a deep groove machined around its outside (**Figure 4**). The curved shift fork arm rides in this groove, controlling the side-to-side sliding of the gear and therefore the selection of different gear ratios. Each shift fork slides back and forth on a shift fork shaft (A, **Figure 5**). Each shift fork has a peg (B, **Figure 5**) that rides in a groove (**Figure 6**) machined in the shift drum. When the shift linkage rotates the shift drum, the zigzag grooves move the shift forks thus sliding the gears back and forth to shift from gear-to-gear.

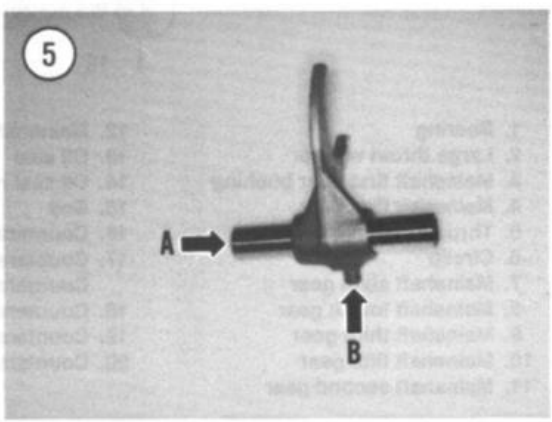
TRANSMISSION OVERHAUL

Removal/Installation

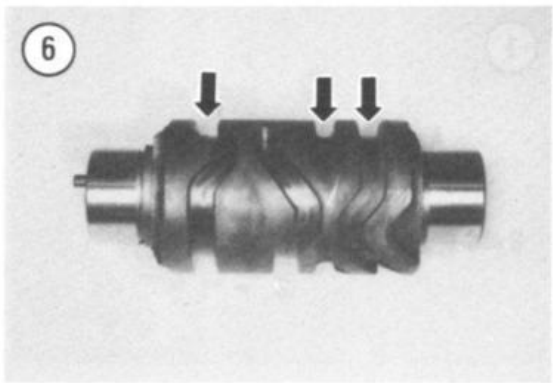
Remove and install the transmission and internal shift mechanism as described under *Crankcase Disassembly* and *Crankcase Assembly* in Chapter Five.

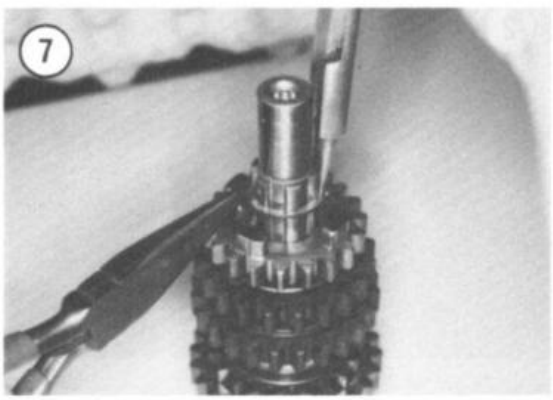
Transmission Service Notes

1. A divided container such as a 3 dozen egg flat can be used to help maintain correct alignment and position of the parts as they are removed from the transmission shafts.



2. The circlips are a tight fit on the transmission shafts. Circlips are relatively inexpensive and should all be replaced every time the transmission is dissembled.
3. Circlips will turn and fold over, making removal and installation difficult. To ease circlip installation, open the circlip with a pair of circlip pliers while at the same time holding the back of the circlip with a pair of pliers and install it (**Figure 7**).
4. When installing a new circlip, open it just enough to slide it over the transmission shaft. If they are opened too much they can become distorted and will not grip the shaft properly.





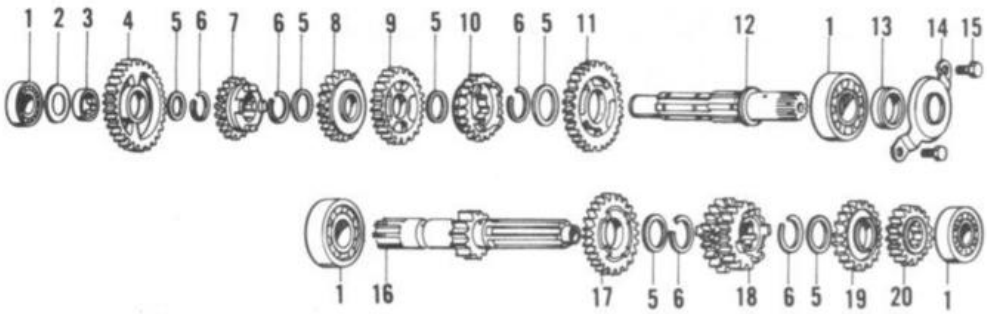
Mainshaft Disassembly

Refer to **Figure 8** for this procedure.

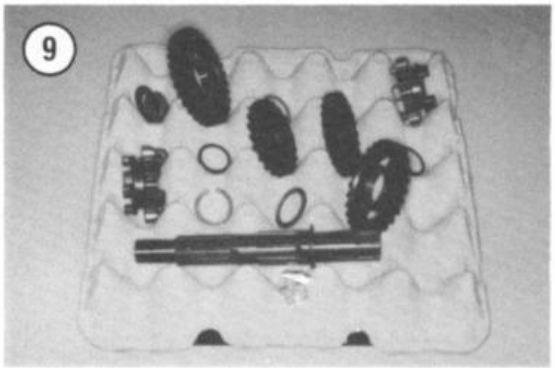
Suzuki does not provide specific dimensions for the transmission components. If your transmission was not operating correctly prior to disassembly, refer to a Suzuki service department for advice.

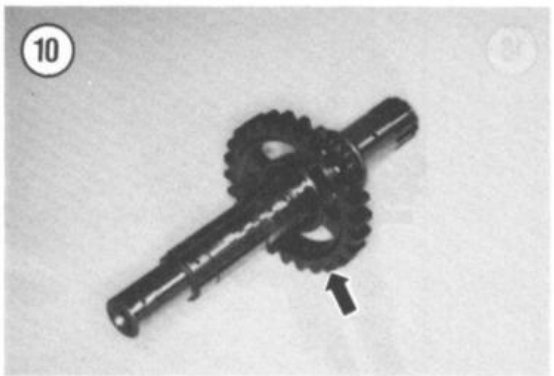
NOTE
A helpful "tool" that should be used for transmission disassembly is a large egg flat (the type restaurants get their eggs

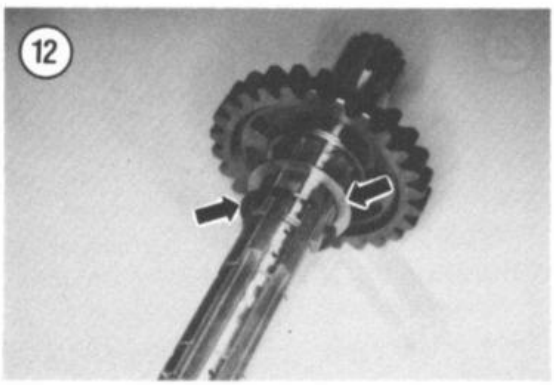
8 **TRANSMISSION**



1. Bearing
2. Large thrust washer
3. Mainshaft first gear bushing
4. Mainshaft first gear
5. Thrust washer
6. Circlip
7. Mainshaft sixth gear
8. Mainshaft fourth gear
9. Mainshaft third gear
10. Mainshaft fifth gear
11. Mainshaft second gear
12. Mainshaft
13. Oil seal
14. Oil seal retainer
15. Bolt
16. Countershaft/first gear
17. Countershaft sixth gear (1990-1991)
    Countershaft sixth gear and sixth gear bushing (1992-on)
18. Countershaft third/fourth combination gear
19. Countershaft fifth gear
20. Countershaft second gear







in). See ***Figure 9****. As you remove a part from the shaft, set it in one of the depressions in the same position from which it was removed. This is an easy way to remember the correct relationship of all parts.*

1. Place the assembled shaft into a large can or plastic bucket and thoroughly clean with solvent and a stiff brush. Dry with compressed air or let sit on rags to drip dry.
2. Remove the end washer then slide off the first gear and first gear bushing.
3. Slide off the washer and remove the circlip.
4. Slide off the sixth gear.
5. Remove the circlip and slide off the washer.
6. Slide off the fourth gear and third gear.
7. Slide off the washer and the fifth gear.
8. Remove the circlip and slide off the washer.
9. Slide off the second gear.
10. Inspect the mainshaft parts as described in this chapter.

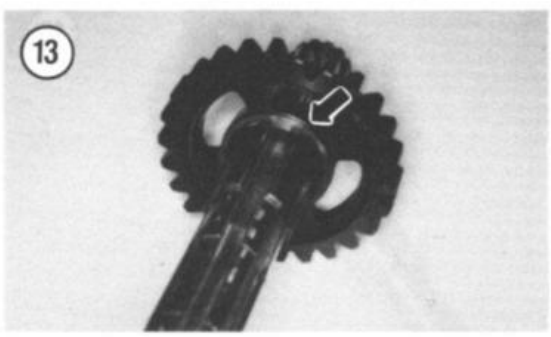
Mainshaft Assembly

Refer to **Figure 8** for this procedure.

NOTE

Suzuki suggests that all circlips be replaced ***every*** *time the transmission is disassembled to ensure proper gear alignment.*

1. Coat all sliding surfaces with clean engine oil.
2. Slide on the second gear (**Figure 10**) with the smaller offset side (**Figure 11**) going on first.
3. Install the washer and circlip (**Figure 12**).
4. Make sure the circlip (**Figure 13**) is properly seated in the groove.



5. Position the fifth gear with the shift fork groove side (**Figure 14**) going on last and slide on the gear (A, **Figure 15**).

6. Install the washer (B, **Figure 15**).

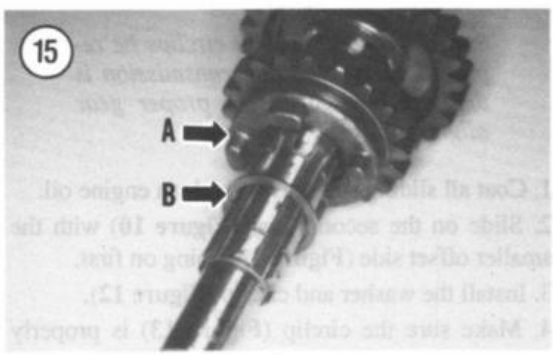
7. Position the third gear with the flush side going on last and slide on the gear (**Figure 16**).

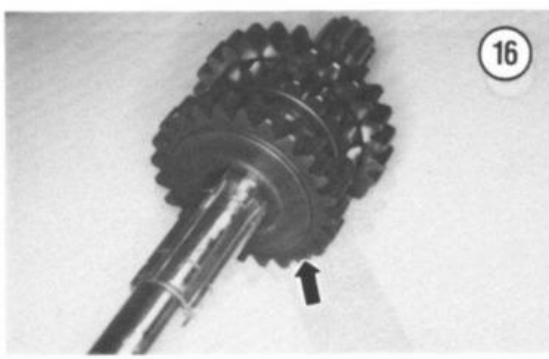
8. Position the fourth gear with the dog slot side going on last and slide on the gear (**Figure 17**).

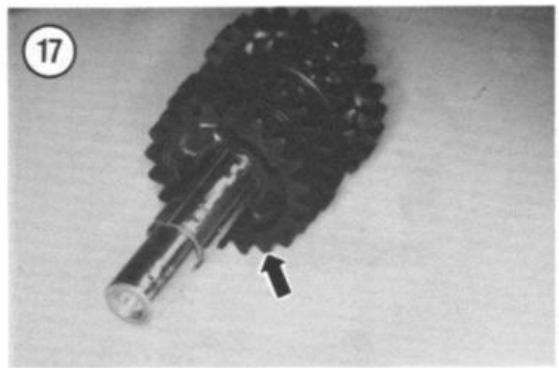
9. Install the washer and circlip (**Figure 18**).

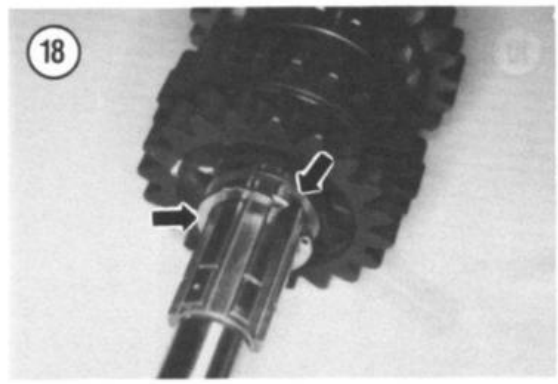
10. Make sure the circlip (**Figure 19**) is properly seated into the groove.

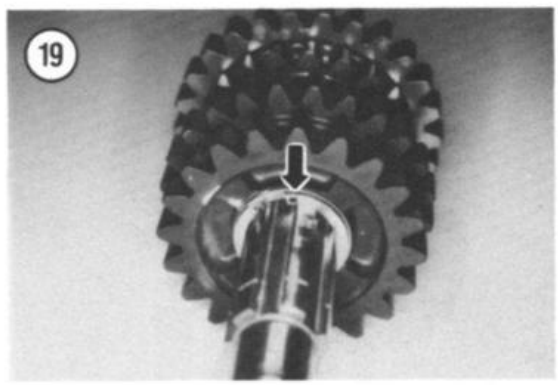
11. Position the sixth gear with the dog side going on last and slide on the gear (**Figure 20**).

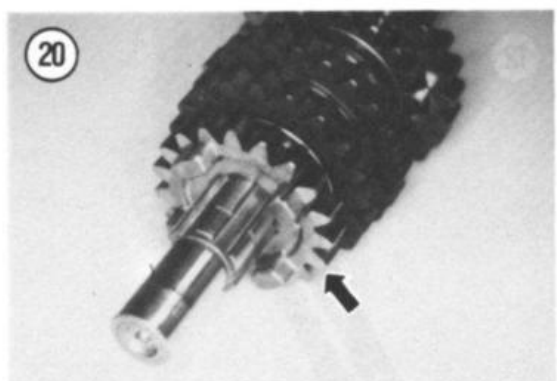


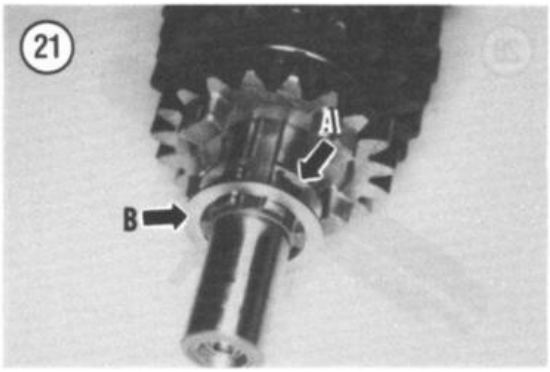




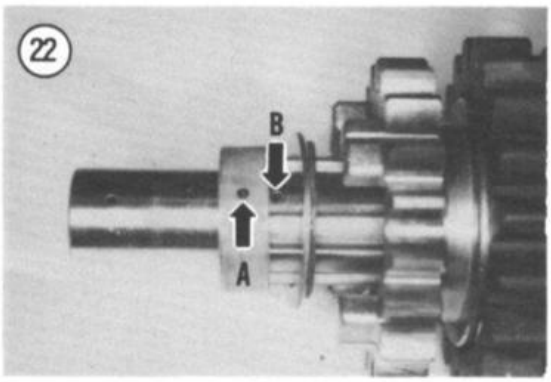








12. Install the circlip (A, **Figure 21**) and make sure it is properly seated in the groove.
13. Install the washer (B, **Figure 21**).
14. Align the oil hole (A, **Figure 22**) with the oil hole (B, **Figure 22**) in the shaft and slide on the first gear bushing (**Figure 23**). This alignment is necessary for proper gear lubrication.
15. Install the first gear onto the first gear bushing (A, **Figure 24**) and slide on the end washer (B, **Figure 24**).
16. After assembly is complete, refer to **Figure 25** for the correct placement of all gears.

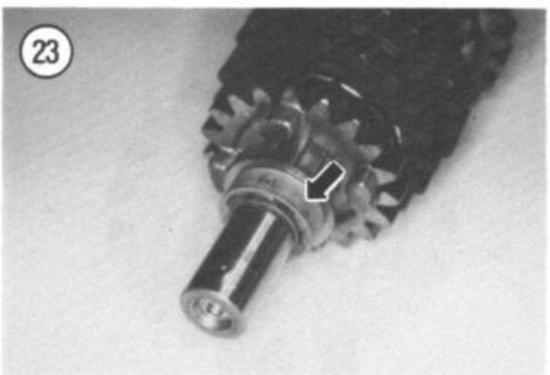


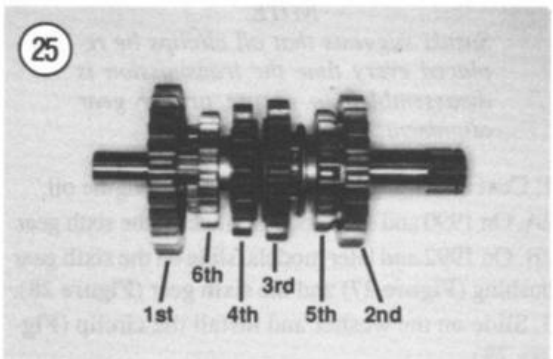
Countershaft Disassembly

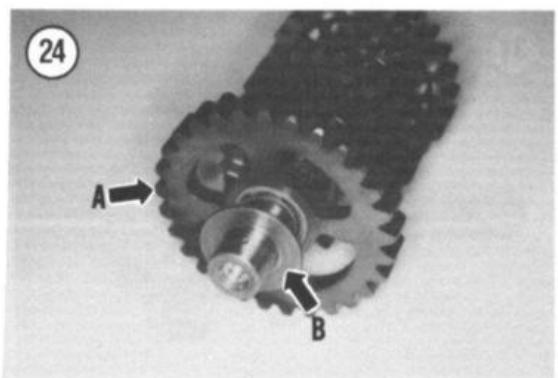
Refer to **Figure 8** for this procedure.

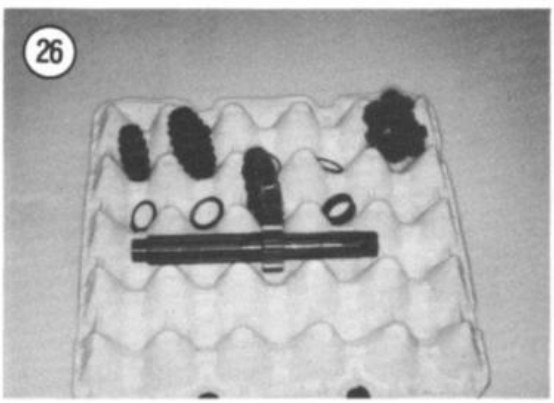
NOTE

*A helpful "tool" that should be used for transmission disassembly is a large egg flat (the type restaurants get their eggs in). See **Figure 26**. As you remove a part from the shaft, set it in one of the depressions in the same position from which it was removed. This is an easy way to*









remember the correct relationship of all parts.

1. Place the assembled shaft into a large can or plastic bucket and thoroughly clean with solvent and a stiff brush. Dry with compressed air or let it sit on rags to drip dry.
2. On electric start models, slide the spacer off the end of the transmission shaft.
3. Slide off the second gear and fifth gear.
4. Slide off the washer and remove the circlip.
5. Slide off the third/fourth combination gear.
6. Remove the circlip and slide off the washer.
7A. On 1990 and 1991 models, slide off the sixth gear.
7B. On 1992 and later models, slide off the sixth gear and the sixth gear bushing.
8. The mainshaft first gear is part of the mainshaft assembly.
9. Inspect the countershaft parts as described in this chapter.

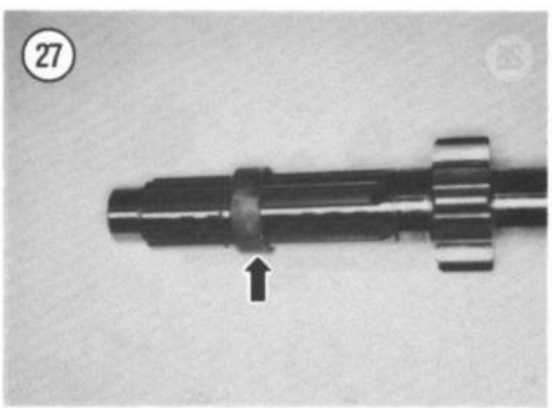
Countershaft Assembly

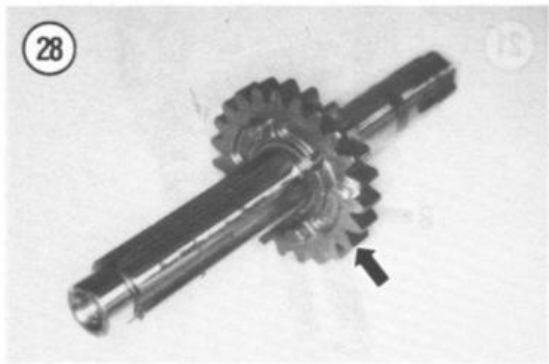
Refer to **Figure 8** for this procedure.

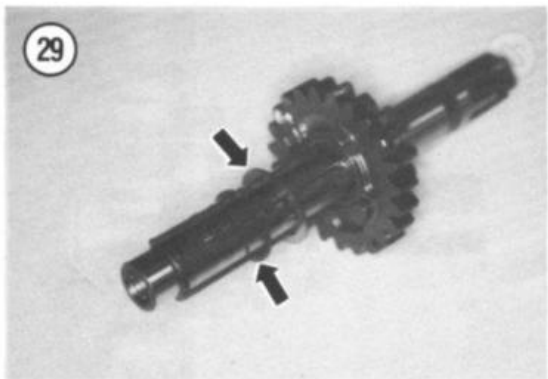
NOTE

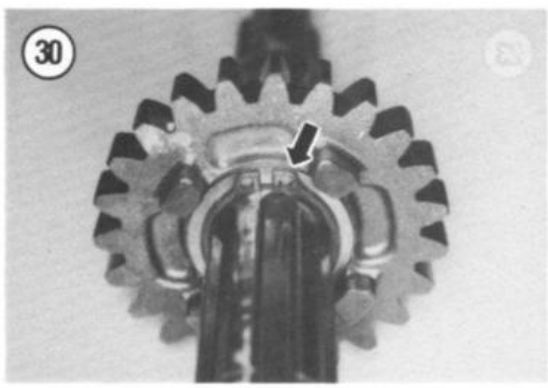
*Suzuki suggests that all circlips be replaced **every** time the transmission is disassembled to ensure proper gear alignment.*

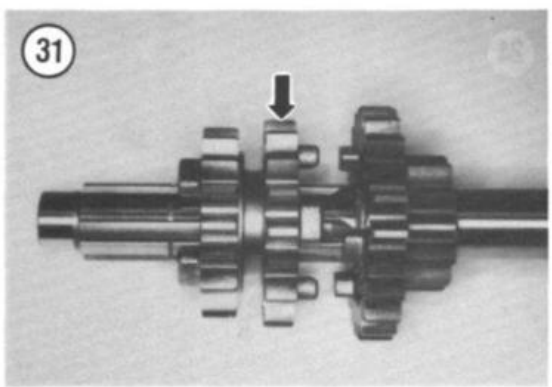
1. Coat all sliding surfaces with clean engine oil.
2A. On 1990 and 1991 models, slide on the sixth gear.
2B. On 1992 and later models, slide on the sixth gear bushing (**Figure 27**) and the sixth gear (**Figure 28**).
3. Slide on the washer and install the circlip (**Figure 29**).

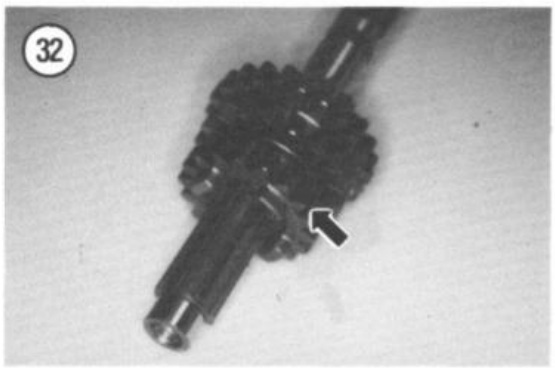


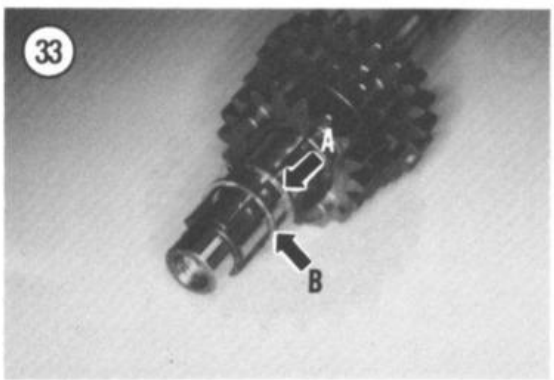


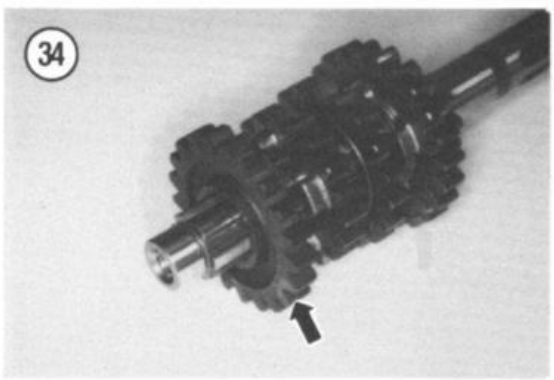


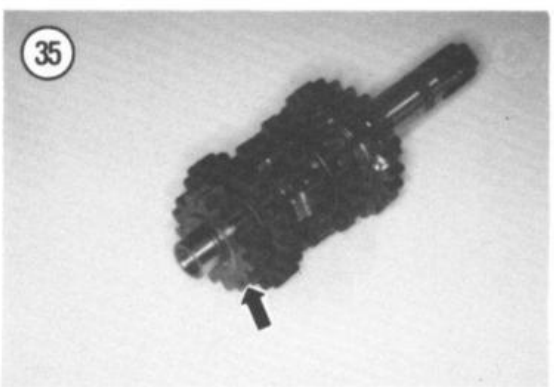








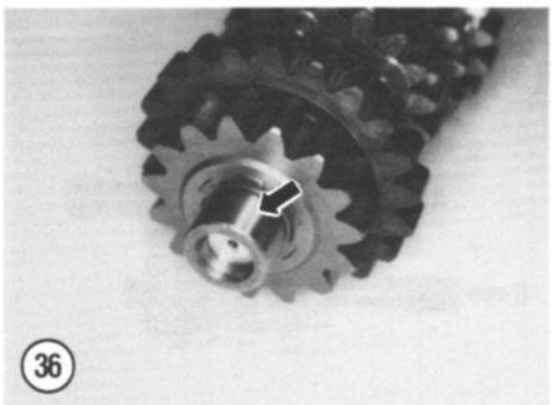


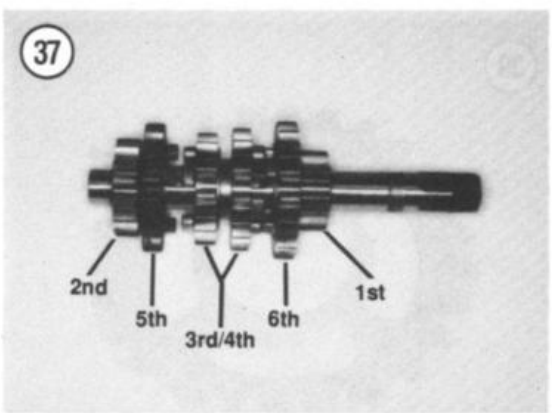


4. Make sure the circlip (**Figure 30**) is properly seated in the groove.
5. Position the third/fourth combination gear with the larger outer diameter fourth gear side going on first (**Figure 31**).
6. Slide on the third/fourth combination gear (**Figure 32**).
7. Install the circlip (A, **Figure 33**) and make sure it is properly seated in the groove.
8. Install the washer (B, **Figure 33**).
9. Slide on the fifth gear (**Figure 34**).
10. Slide on the second gear (**Figure 35**).
11. On electric start models, install the spacer (**Figure 36**).
12. After assembly is complete, refer to **Figure 37** for the correct placement of all gears.

NOTE

*After both transmission shafts have been assembled, mesh the mainshaft (A, **Figure 38**) and countershaft (B, **Figure 38**) together in the correct position. Check that all gears meet correctly. This*

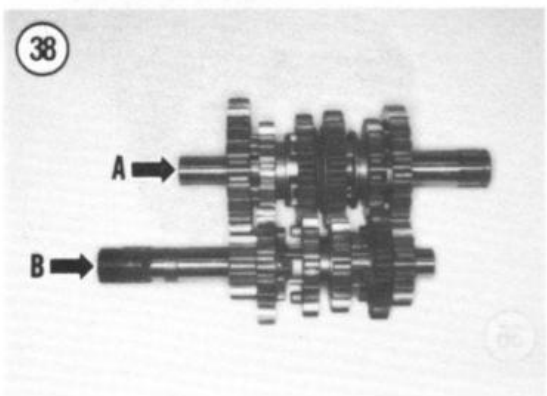


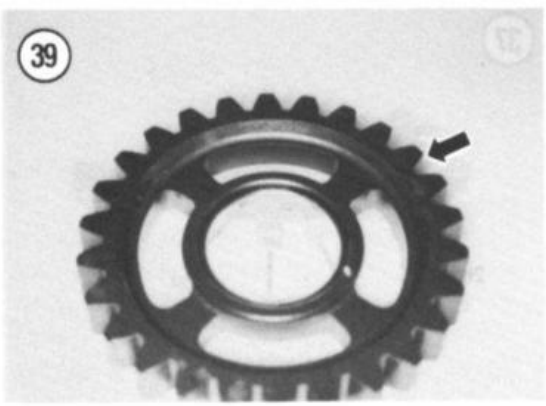


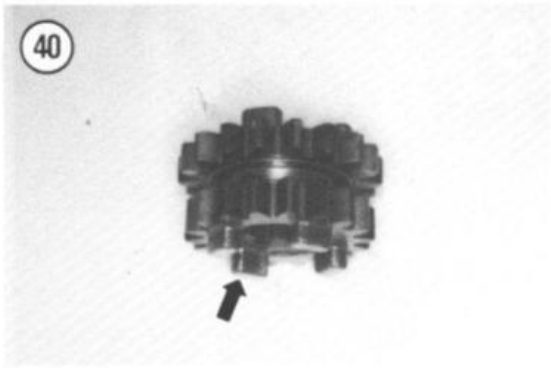
is your last check prior to installing the assemblies into the crankcase to make sure they are correctly assembled.

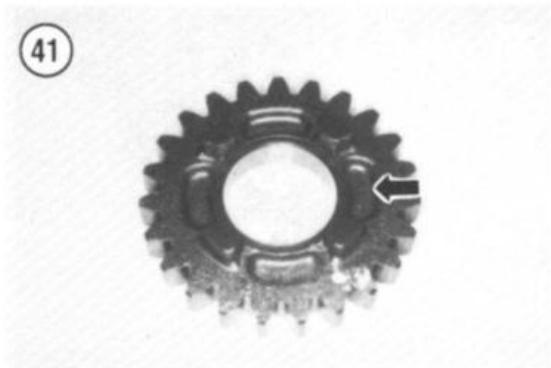
Transmission Inspection

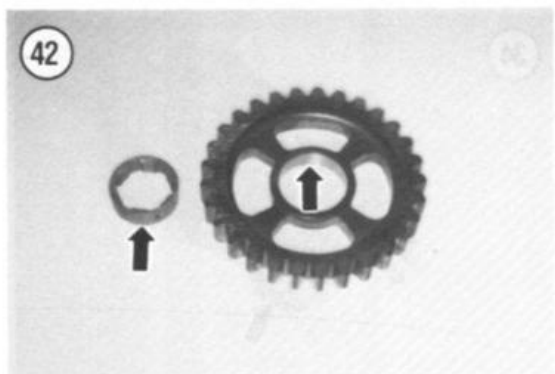
1. Check each gear for excessive wear, burrs, pitting or chipped or missing teeth (**Figure 39**).
2. Make sure the lugs (dogs) (**Figure 40**) on the gears are in good condition.
3. Make sure the lugs (dogs) receptacles (**Figure 41**) on the gears are in good condition.
4. On 1992 and later models, inspect the rotating surfaces of the countershaft sixth gear and the sixth gear bushing (**Figure 42**) for wear or scoring. Replace as a set if either are damaged.
5. Check each sliding gear shaft internal splines (**Figure 43**) for wear, cracks or other damage. Replace as necessary.
6. Check each rotating gear bore (**Figure 44**) for scoring, cracks or other damage.
7. Make sure that all gears slide or turn on their respective shafts smoothly. If any gear movement is

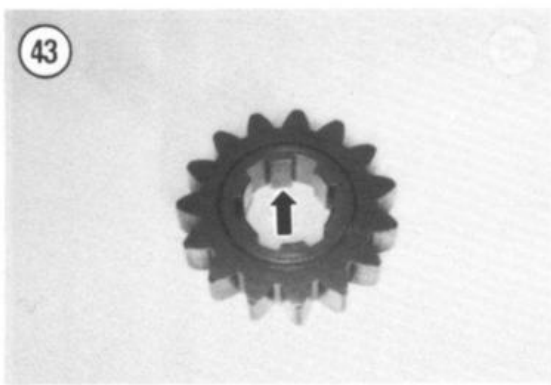


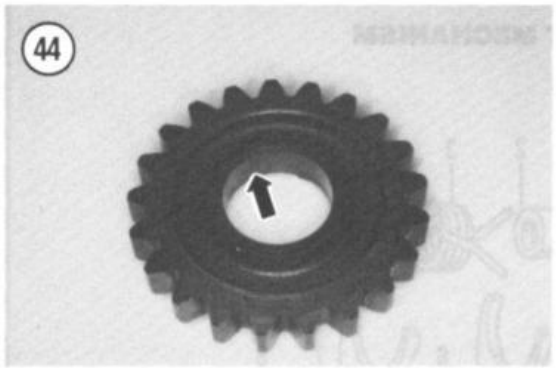


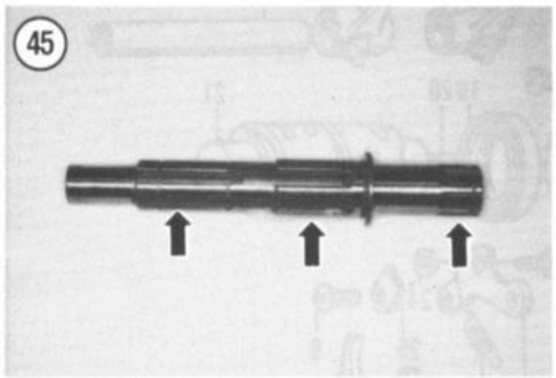


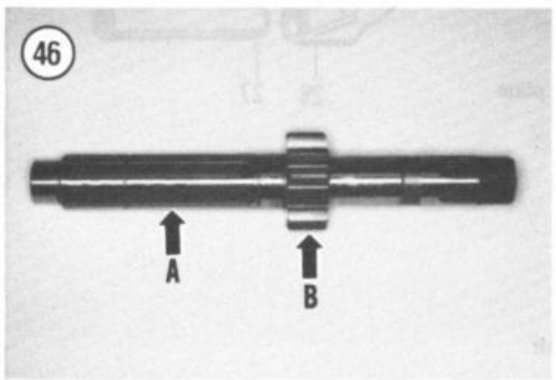


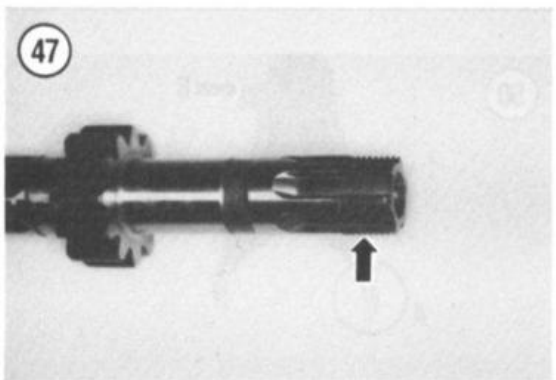












noisy or rough, replace the gear and/or shaft as required.

NOTE

Defective gears should be replaced and it is a good idea to replace the mating gear even though it may not show as much wear or damage.

8. Check the splines of the mainshaft (**Figure 45**) and countershaft (A, **Figure 46**) for wear, cracks or other damage.
9. Check the countershaft first gear (B, **Figure 46**). If the gear is damaged, replace the countershaft assembly.
10. Inspect the clutch nut threads (**Figure 47**) on the end of the countershaft for wear or damage. Clean up with a thread die or replace if the threads are beyond repair.
11. Check the circlip groove(s) of the mainshaft and countershaft for wear or other damage.
12. Place each transmission shaft on V-blocks and check runout with a dial indicator. If runout exceeds 0.08 mm (0.0031 in.), replace the transmission shaft.
13. *Replace all circlips* during reassembly. In addition, check the washers for burn marks, scoring or cracks. Replace if necessary.

INTERNAL SHIFT MECHANISM

Removal/Installation

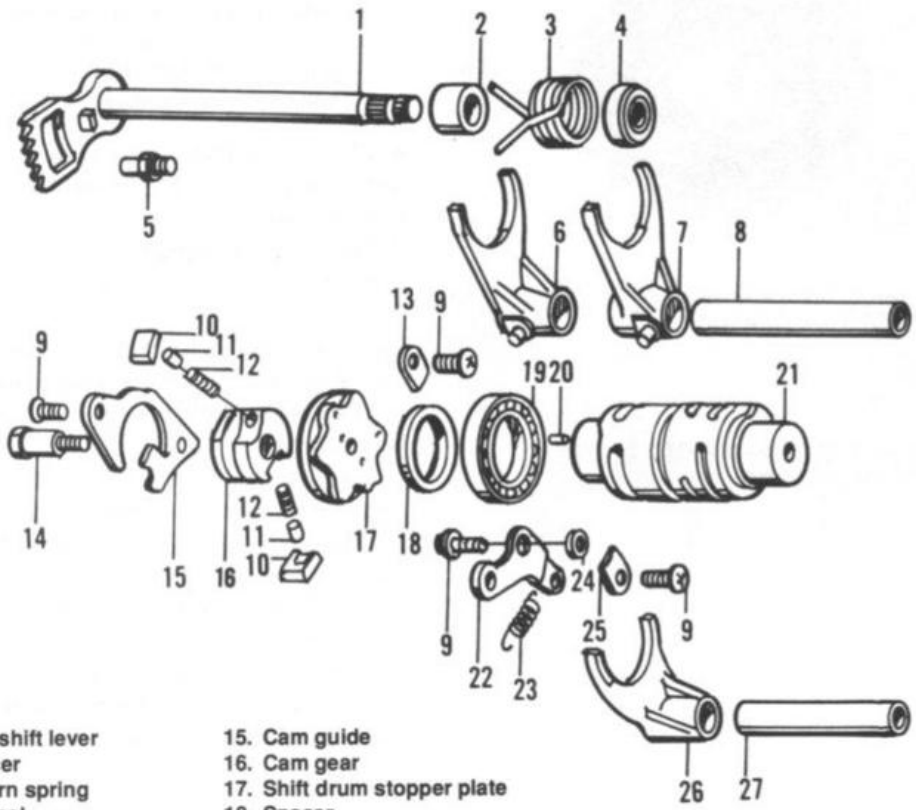
Remove and install the transmission and internal shift mechanism as described under *Crankcase Disassembly* and *Crankcase Assembly* in Chapter Five.

Shift Fork Inspection

Refer to **Figure 48** for this procedure.
1. Inspect each shift fork (**Figure 49**) for signs of wear or cracking.
2. Examine the shift forks at the points where they contact the slider gear (A, **Figure 50**). The surface should be smooth with no signs of wear or damage.
3. Make sure the forks slide smoothly on their respective shafts (**Figure 51**).
4. Make sure the shafts are not bent. This can be checked by removing the shift forks from the shaft

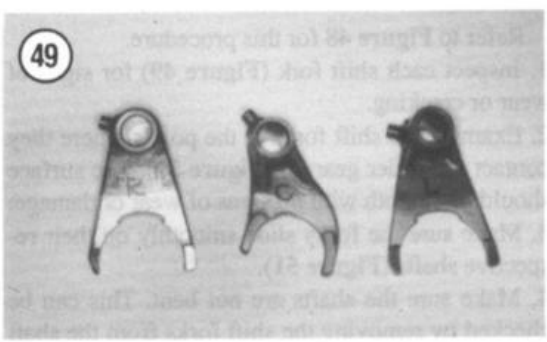
(48)

INTERNAL SHIFT MECHANISM



1. Gearshift lever
2. Spacer
3. Return spring
4. Oil seal
5. Threaded pin
6. Shift fork No. 1
7. Shift fork No. 2
8. Long shift fork shaft
9. Screw
10. Pawl
11. Pin
12. Spring
13. Bearing retainer
14. Special bolt
15. Cam guide
16. Cam gear
17. Shift drum stopper plate
18. Spacer
19. Bearing
20. Pin
21. Shift drum
22. Shift drum stopper
23. Spring
24. Washer
25. Bearing retainer
26. Shift fork No. 3
27. Short shift fork shaft

(49)



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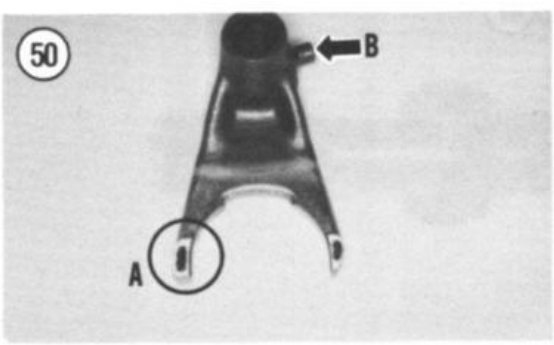
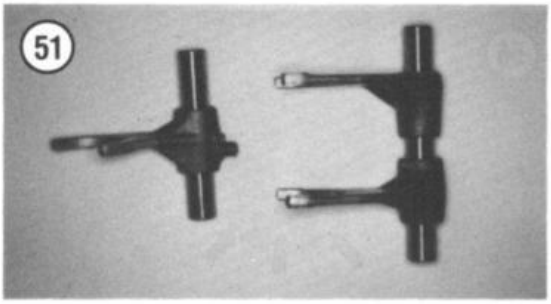
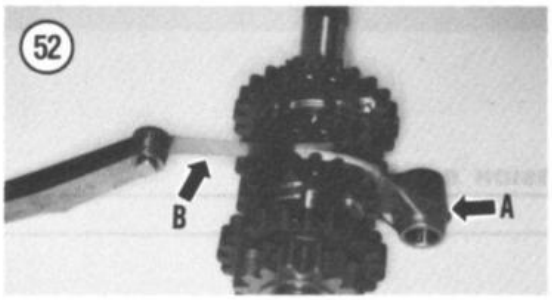
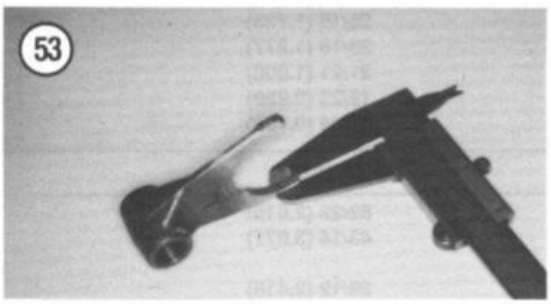
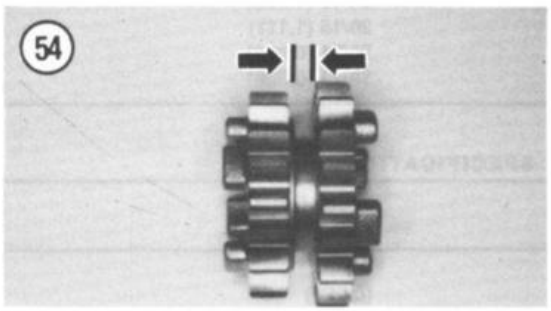










and rolling the shaft on a piece of plate glass. Any clicking noise detected indicates that the shaft is bent and should be replaced.

5. Check each shift fork peg (B, **Figure 50**) for wear or damage.

6. Check for any arc-shaped wear or burn marks on the shift forks. This indicates that the shift fork has come in contact with the gear. The fork fingers have become excessively worn and the fork must be replaced.

Shift Fork-to-Gear Clearance

1. Insert the shift fork (A, **Figure 52**) into it's respective gear.

2. Insert a flat feeler gauge between the shift fork and the gear groove (B, **Figure 52**). Compare to the dimension listed in **Table 2**. If the clearance is greater than specified, perform Step 3 and Step 4 to determine which part is worn.

3. Measure the shift fork at the points where it contacts the slider gear (**Figure 53**). Compare to the dimension listed in **Table 2**. Replace if necessary.

4. Measure the gear shift fork groove (**Figure 54**) with a vernier caliper. Compare to the dimension listed in **Table 2**. Replace if necessary.

Shift Drum Inspection

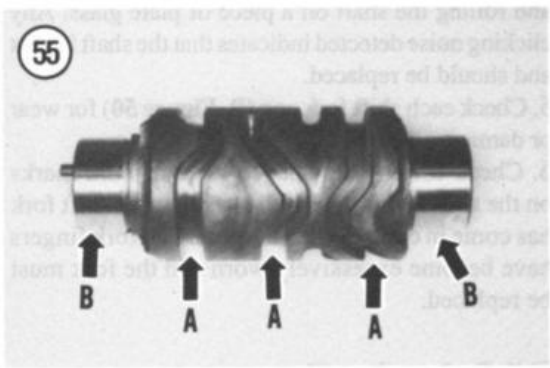
Refer to **Figure 48** for this procedure.

1. Check the grooves in the shift drum (A, **Figure 55**) for wear or roughness. Clean up any minor roughness but if there is any major roughness, replace the shift drum.

2. Check the bearing surface (B, **Figure 55**) on the opposite end for wear or damage.

3. Inspect the locating dowels and threaded hole (**Figure 56**) in the end of the shift drum for wear or damage. Replace the shift drum if necessary.

Figures 55, 56 and Tables 1-2 are on the following page.



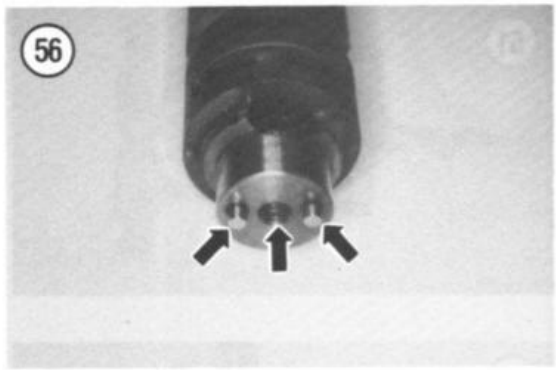


Table 1 TRANSMISSION RATIOS

	DR250	DR250S
Primary reduction ratio	62/22 (2.818)	62/22 (2.818)
Final reduction ratio	49/13 (3.769)	48/13 (3.692)
Gear ratios		
1st	29/12 (2.416)	29/12 (2.416)
2nd	26/15 (1.733)	26/15 (1.733)
3rd	24/18 (1.333)	23/18 (1.277)
4th	20/18 (1.111)	21/21 (1.000)
5th	20/21 (0.962)	19/23 (0.826)
6th	19/23 (0.826)	17/24 (0.708)
	DR350	**DR350S**
Primary reduction ratio	62/22 (2.818)	62/22 (2.818)
Final reduction ratio	47/14 (3.357)	43/14 (3.071)
Gear ratios		
1st	29/12 (2.416)	29/12 (2.416)
2nd	26/15 (1.733)	26/15 (1.733)
3rd	24/18 (1.333)	24/18 (1.333)
4th	20/18 (1.111)	20/18 (1.111)
5th	20/21 (0.962)	20/21 (0.962)
6th	19/23 (0.826)	19/23 (0.826)

Table 2 SHIFT FORK SPECIFICATIONS

	Specification mm (in.)	Wear limit mm (in.)
Shift fork-to-gear clearance	0.1-0.3 (0.004-0.012)	0.5 (0.020)
Gear shift fork groove width	5.0-5.1 (0.197-0.200)	—
Shift fork thickness	4.8-4.9 (0.189-0.193)	—

CHAPTER EIGHT

FUEL, EXHAUST AND EMISSION CONTROL SYSTEMS

The fuel system consists of the fuel tank, shutoff valve, a single Mikuni carburetor assembly and foam type air filter. There are two different types of carburetors used among the various models and they are noted in the various procedures.

The exhaust system consists of an exhaust pipe and a muffler assembly that is used on all models.

All DR250S and DR350S models originally sold in California are equipped with an Evaporative Emission Control System and all models are equipped with a Crankcase Ventilation Control System.

This chapter includes service procedures for all parts of the fuel, exhaust and emission control systems.

Carburetor specifications are listed in **Table 1**. **Tables 1-2** are at the end of the chapter.

CARBURETOR SERVICE

Carburetor Identification

Refer to **Table 1** for carburetor specifications for all models.

The carburetor used on 1990-1991 DR250S and 1990-1991 DR350S models are equipped with a single throttle cable setup. All other models are equipped with a dual throttle cable setup.

On dual cable models, one cable is a "pull" cable and the other is a "push" cable. At the throttle grip, the "push" cable (front cable) is located next to the master cylinder body and the "pull" cable (rear cable) is closer to the rider. At the carburetor throttle wheel, the "push" cable is located in the front slot in the throttle wheel and the "pull" cable is located in the rear slot in the throttle wheel.

Removal/Installation (All Models)

NOTE

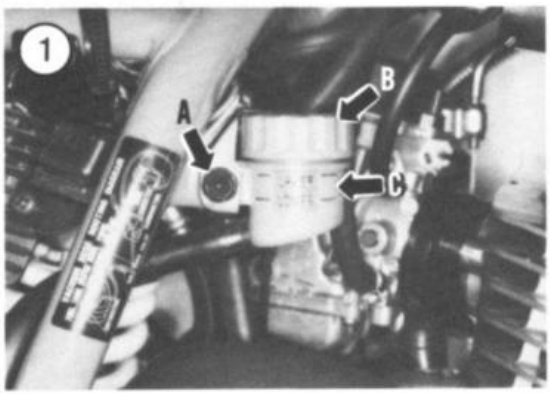
This procedure is shown on a DR250S model with dual throttle cables. Where differences occur with other models, they are identified.

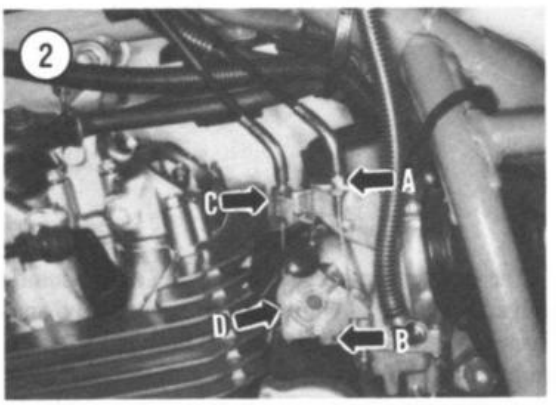
1. Place wood block(s) under the engine to support the bike securely.
2. Remove the seat as described in Chapter Thirteen.
3. Remove the fuel tank as described in this chapter.
4. Remove the rear brake reservoir as follows:
   a. Remove the bolt (A, **Figure 1**) and bracket securing the rear master cylinder reservoir to the frame.
   b. Make sure the cap (B, **Figure 1**) is on tight, then move the reservoir (C, **Figure 1**) and hose out of the way. Keep the reservoir upright to prevent the entry of air into the system.
   c. Reinstall the bolt and bracket onto the frame to avoid misplacing them.

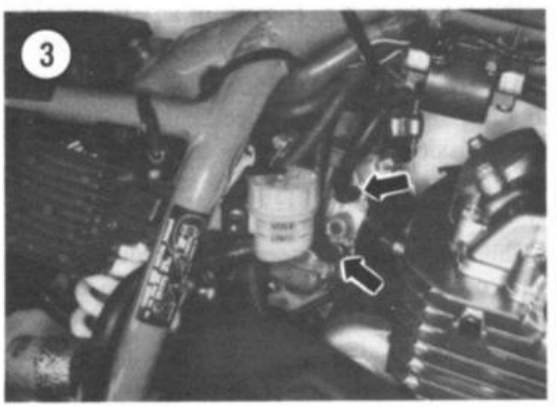
5A. On single throttle cable models, perform the following at the carburetor:
   a. Loosen the throttle cable locknuts and disconnect the throttle cable from the throttle wheel.
   b. Remove the cable from the bracket on the carburetor body.

5B. On dual throttle cable models, perform the following at the carburetor:
   a. Loosen the No. 1 "pull" throttle cable adjuster locknuts (A, **Figure 2**) and disconnect the throttle cable (B, **Figure 2**) from the throttle wheel on the carburetor assembly.
   b. Loosen the No. 2 throttle "push" cable adjuster locknuts (C, **Figure 2**) and disconnect the throttle cable (D, **Figure 2**) from the throttle wheel on the carburetor assembly.

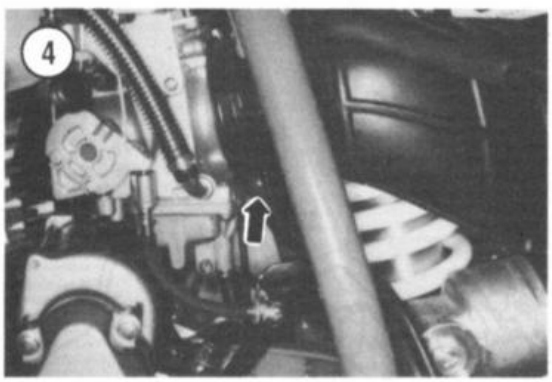
6. Disconnect the hose(s) (**Figure 3**) from the right-hand side of the carburetor. Plug the end(s) with a golf tee(s) to prevent the entry of foreign matter.
7. Completely unscrew the clamping screw (**Figure 4**) on the rear rubber inlet boot. Slide the clamp off the inlet boot and remove it.
8. Completely unscrew the clamping screw (**Figure 5**) on the front intake pipe. Slide the clamp off the intake pipe and completely remove it.
9. Carefully work the carburetor assembly free from the rear inlet boot and then from the front intake pipe, then remove it from the left-hand side of the frame.
10. Take the carburetor assembly to a workbench for disassembly and cleaning. If the carburetor assembly is not going to be disassembled, place it in a clean reclosable plastic bag and close the bag to prevent it from getting dirty.
11. Stuff a clean shop rag (**Figure 6**) into the intake pipe on the cylinder head to prevent dirt and other debris from entering the cylinder head.
12. Install by reversing these removal steps while noting the following:

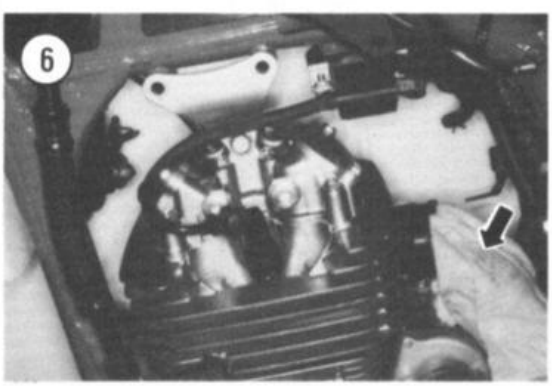






a. Apply a light coat of rubber lubricant or Armor All around the ends of the intake pipe and the rubber inlet boot to make carburetor installation easier.
b. Make sure the carburetor assembly is properly positioned and tighten all clamp screws evenly and securely.
c. Adjust the throttle cable(s) as described under *Throttle Cable Adjustment* in Chapter Three.
d. Connect the fuel line and turn the shutoff valve to the ON position. Check for fuel leaks and if any occur correct the problem before starting the engine.





DR250 and DR350 Models

Disassembly

Refer to **Figure 7** for this procedure.

1. Disconnect the vent line assembly (**Figure 8**) and overflow line (**Figure 9**) from the carburetor.
2. Remove the screws securing the throttle cable bracket (**Figure 10**) and remove the bracket.
3. Remove the screws (A, **Figure 11**), then remove the cover (B, **Figure 11**) and gasket.

NOTE

*Note the location of the plastic washer (**Figure 12**) next to the throttle valve lever. It must be reinstalled in the same location during assembly.*

4. Remove the bolt (**Figure 13**) and washer securing the throttle valve lever to the throttle lever shaft.
5. Partially withdraw the throttle lever shaft and remove the plastic washer (**Figure 14**).
6. Unhook the spring and completely withdraw the throttle lever shaft (A, **Figure 15**) from the throttle valve lever (B, **Figure 15**) and carburetor body. The return spring (C, **Figure 15**) can stay on the carburetor body at this time.
7. Remove the throttle valve assembly (**Figure 16**) from the carburetor body.
8. Note the location of the idle adjust screw cable bracket (**Figure 17**) and the electrical wire strap (**Figure 18**) on the float bowl screws. They must be reinstalled in the same locations during assembly.

NOTE

Perform Step 9 on a work bench and within the confines of a tray with sides. The small spring and plunger may fall out when the float bowl is removed. These parts are very small and are easily lost.

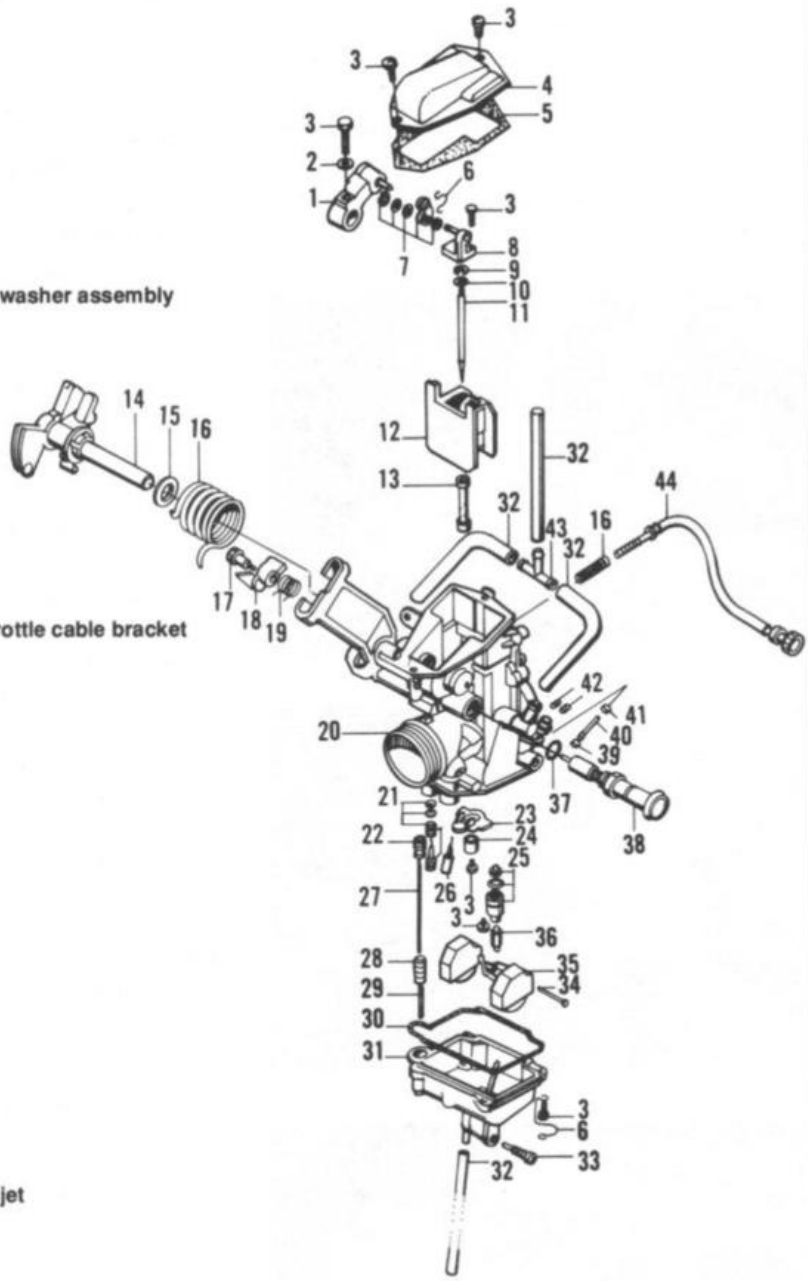
NOTE

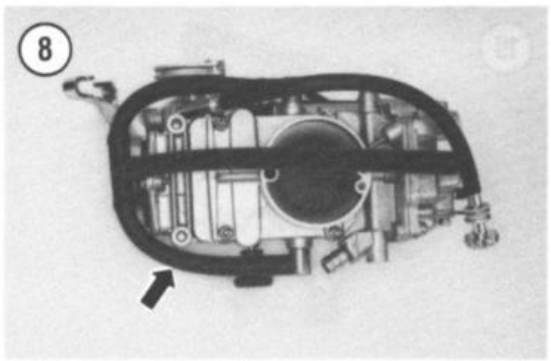
When the float bowl screws are loosened, the float bowl will push away from the base of the carburetor due to the small internal accelerator pump spring.

9. Loosen the screws securing the float bowl (**Figure 19**) in a criss cross pattern.

7 CARBURETOR (DR250 AND DR350)

1. Throttle valve lever
2. Washer
3. Bolt
4. Cover
5. Gasket
6. Retainer
7. Throttle valve plate and washer assembly
8. Throttle valve bracket
9. E-clip
10. Washer
11. Jet needle
12. Throttle valve
13. Main jet nozzle
14. Throttle lever shaft
15. Plastic washer
16. Return spring
17. Special bolt
18. Accelerator pump lever
19. Spring
20. Carburetor body and throttle cable bracket
21. Pilot screw assembly
22. Rubber boot
23. Baffle
24. Collar
25. Float valve set
26. Pilot jet
27. Accelerator pump rod
28. Plunger
29. Spring
30. O-ring gasket
31. Float bowl
32. Tubing
33. Drain screw
34. Float pivot pin
35. Float
36. Float valve
37. O-ring seal
38. Choke assembly
39. Cap
40. Air jet
41. Gasket
42. Main air jet and pilot air jet
43. T-fitting
44. Idle adjust cable

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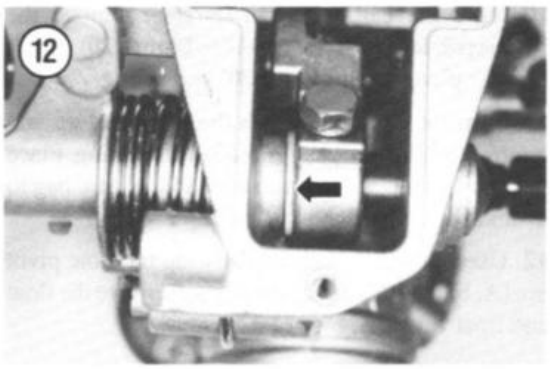
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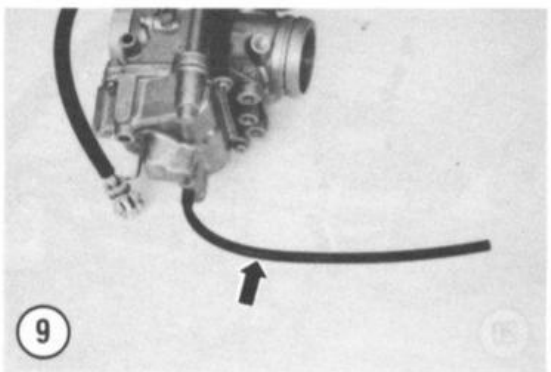
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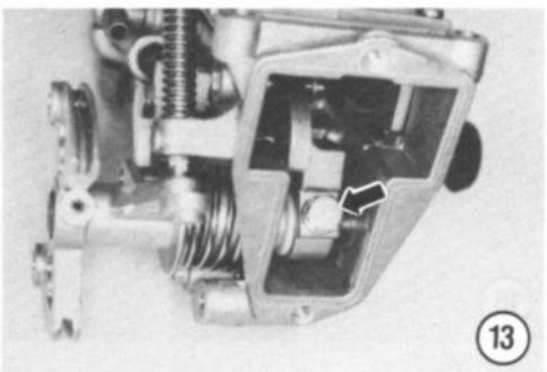
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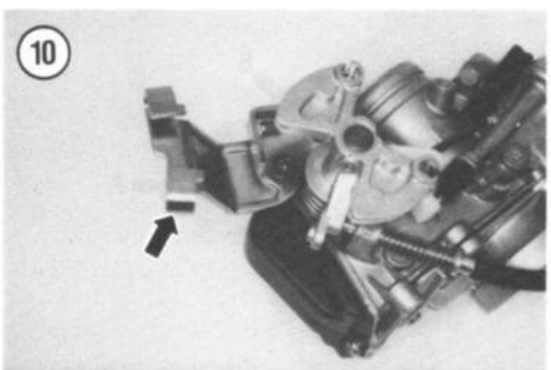
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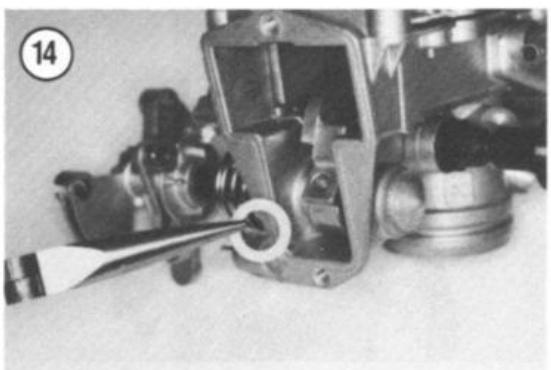
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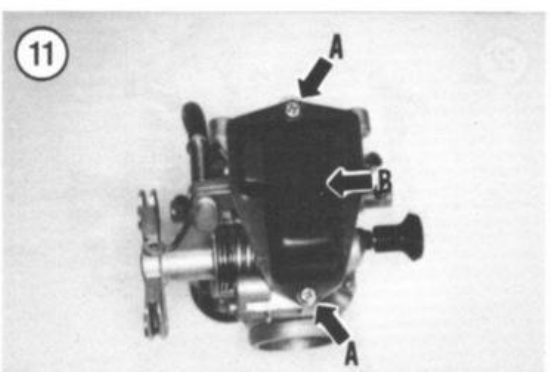
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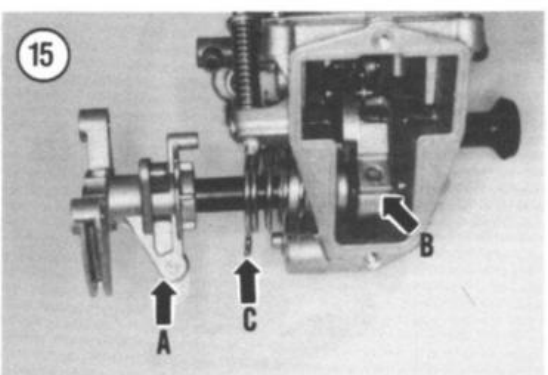
A
B
A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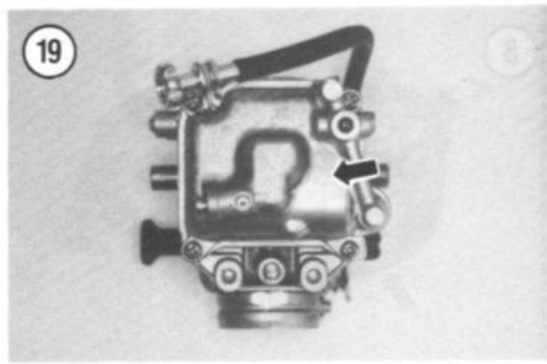
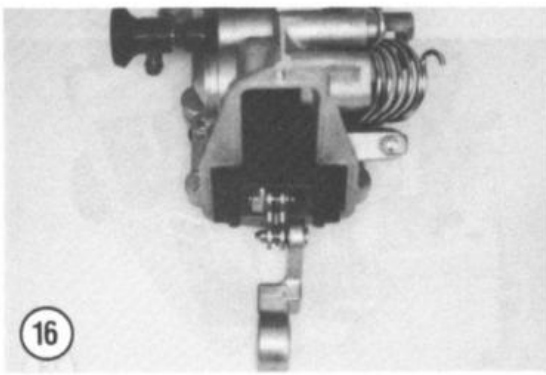
B
A
C

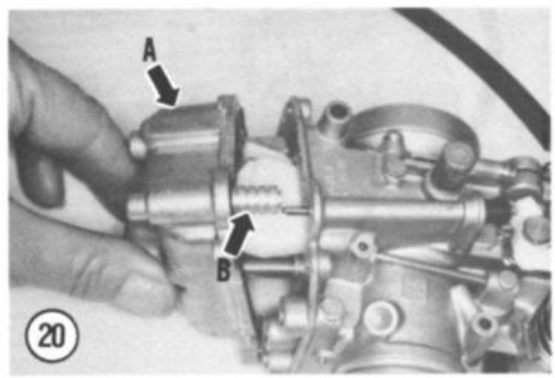
10. Turn the carburetor on its side, remove the screws and then the float bowl (A, **Figure 20**). Don't lose the plunger (B, **Figure 20**) and spring.

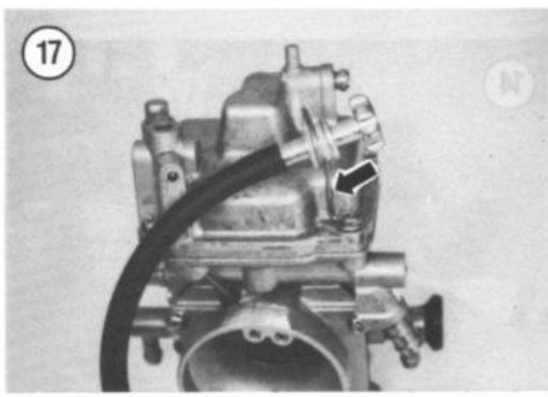
11. Turn the float bowl with the open end up and remove the plunger (A, **Figure 21**) and spring. Place the plunger and spring in a reclosable plastic bag to avoid misplacing them.

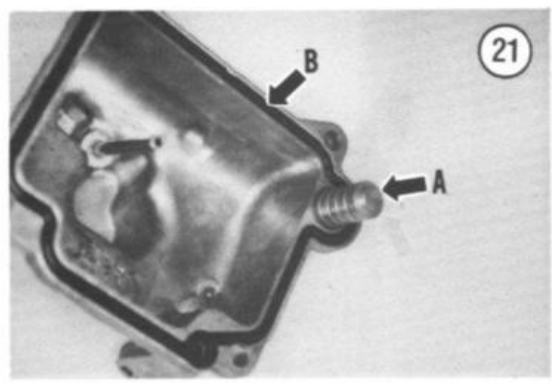
12. Use a thin drift and carefully tap the float pivot pin (A, **Figure 22**) out of the posts. Remove the float and float valve (B, **Figure 22**).

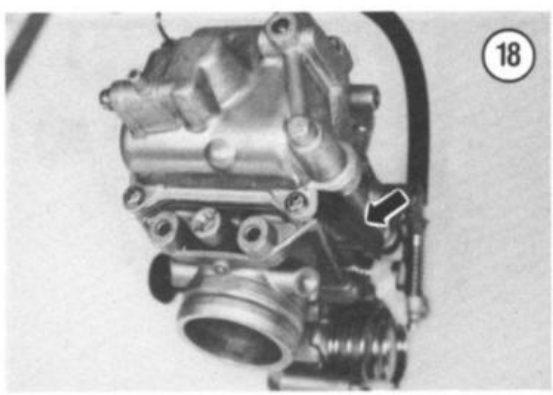


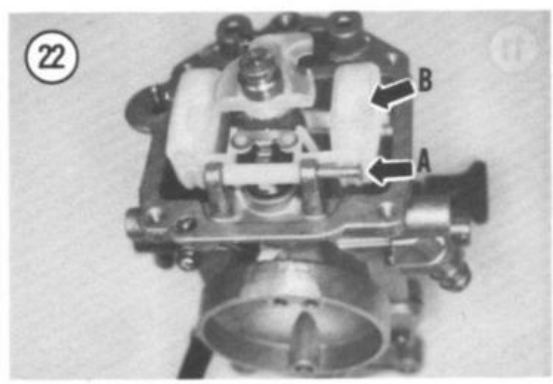


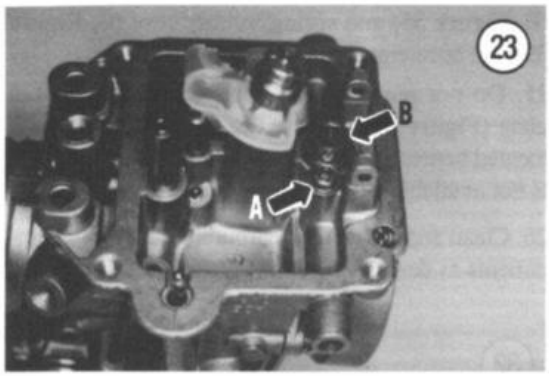








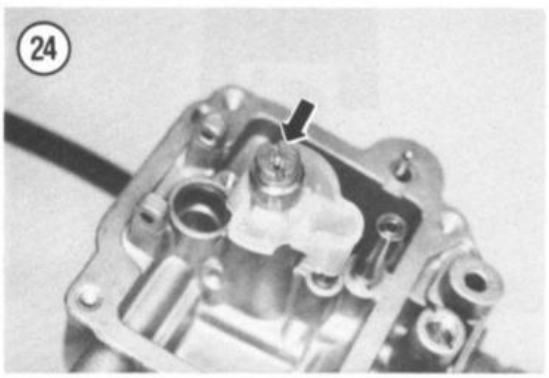




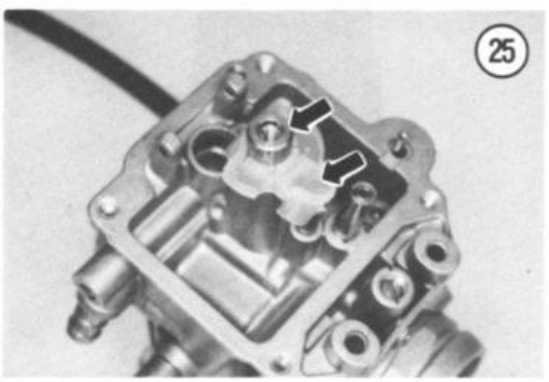
13. Remove the screw (A, **Figure 23**) securing the float valve seat.
14. Use needle nose pliers and carefully remove the valve seat (B, **Figure 23**) from the carburetor body.
15. Unscrew and remove the main jet (**Figure 24**).
16. Remove the collar and baffle assembly (**Figure 25**).
17. Carefully push the main jet nozzle (**Figure 26**) out from the float bowl side and remove it from the throttle valve side of the body.
18. Remove the pilot jet (A, **Figure 27**).

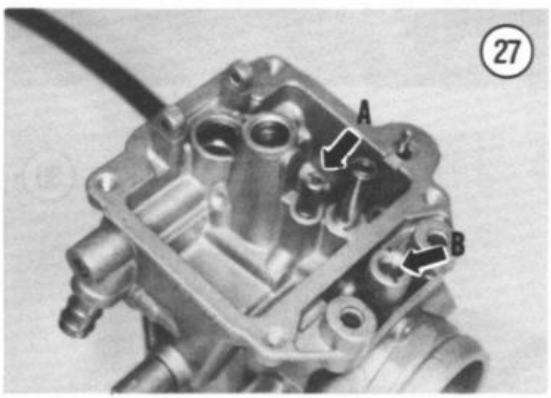
NOTE

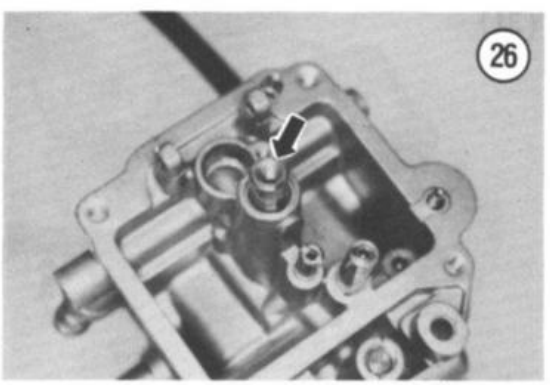
Prior to removing the pilot screw, carefully screw it in until it ***lightly*** *seats. Count and record the number of turns so it can be installed in the same position.*



19. Remove the pilot screw (B, **Figure 27**), spring and washer. The very small O-ring seal will usually stay in the pilot jet receptacle in the carburetor body. Use a small pick and carefully remove the O-ring. Place the spring, washer and O-ring onto the pilot screw (**Figure 28**) to avoid misplacing any of these small parts.







20. Do not remove the air jet (**Figure 29**).

21. Unscrew the choke assembly (**Figure 30**). Don't lose the O-ring seal.

22. To disassemble the throttle valve, perform the following:

a. Remove the Phillips screws securing the throttle valve bracket (A, **Figure 31**) to the throttle valve (B, **Figure 31**).

b. Remove the throttle valve bracket (**Figure 32**).

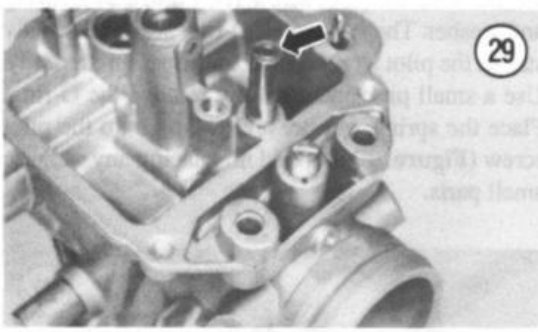
c. Remove the jet needle assembly (**Figure 33**) from the throttle valve.

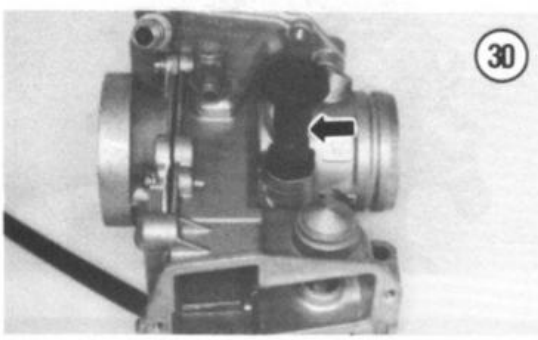
23. Unscrew the idle adjust screw and cable assembly (A, **Figure 34**) from the threaded post (B, **Figure 34**) on the carburetor body.

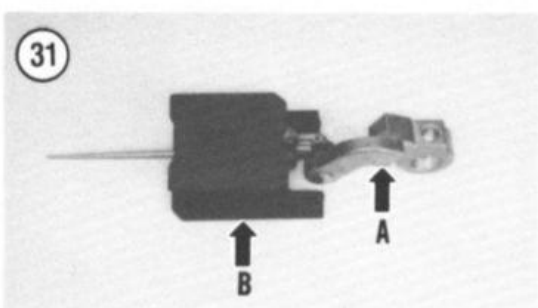
24. If necessary, remove the special bolt (A, **Figure 35**) securing the accelerator lever. Remove the lever (B, **Figure 35**) and spring, rubber boot (C, **Figure 35**) and accelerator rod (D, **Figure 35**).

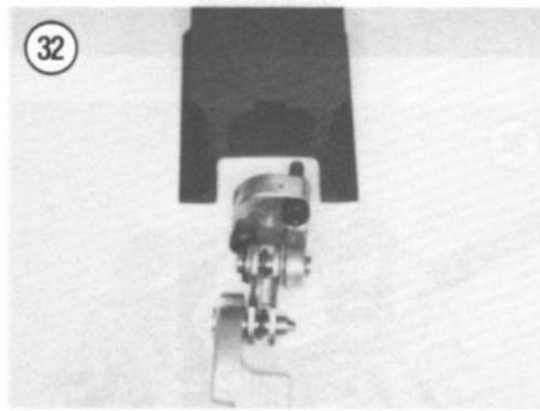
25. Do not remove the screws securing the front plate (**Figure 36**) as there are no serviceable parts located beneath it. Also the gasket for the front plate is not available.

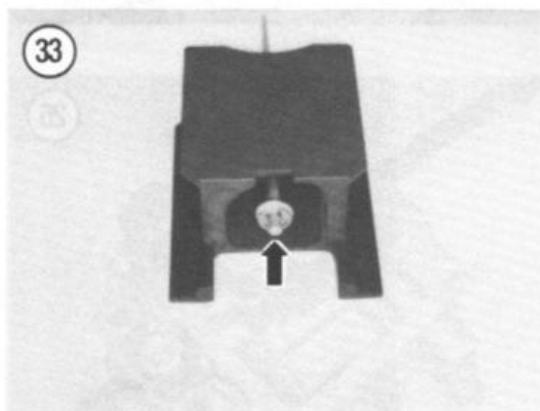
26. Clean and inspect the carburetor assembly components as described in this chapter.

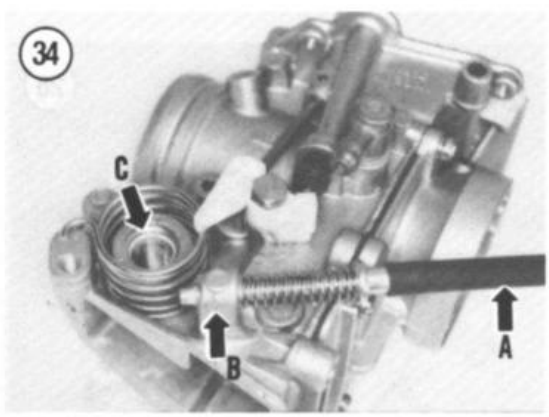












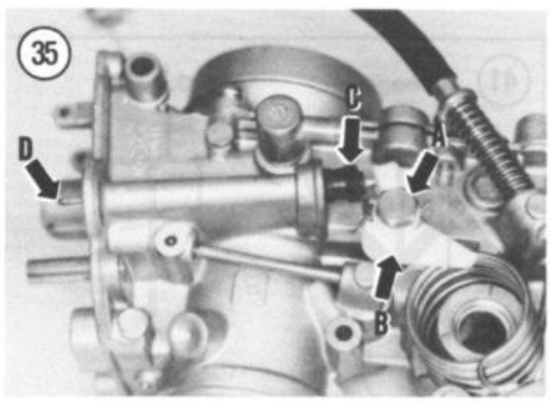
Cleaning/inspection

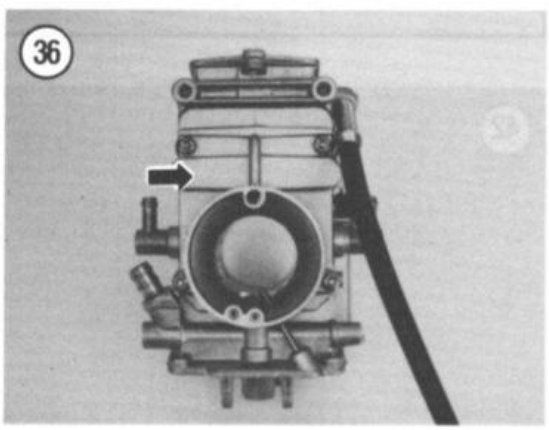
WARNING

Carburetor cleaner is extremely caustic and can cause permanent eye damage. Always wear eye protection when using any type of carburetor cleaner.

Carburetors are best cleaned by completely disassembling them and cleaning the fuel and air orifices with an aerosol carburetor cleaner. Never use a wire to clean out jets or orifices; such a process could enlarge the passage which would adversely affect the air-to-fuel ratio.

Motorcycle carburetors have much smaller air and fuel passages than automotive carburetors. For this reason, soaking the carburetor parts in an automotive type carburetor cleaner is *not* recommended. The exterior of nearly all motorcycle carburetors is usually coated with a corrosion-protective clear coating. These caustic liquid cleaners will remove the protective coatings from the outside of the carburetor body. The dissolved coating could plug one or more of the air or fuel passages within the carburetor plus the exterior appearance of the carburetors will be damaged. Also, if the cleaner was used previously there will be sediment held in suspension within the solution. These could also plug a passage.





Clean the carburetor parts in a good grade of fresh solvent and thoroughly dry with compressed air. Many good aerosol carburetor cleaners (i.e. Zep Choke and Carburetor Cleaner) can help remove any residue not removed with the solvent. Thoroughly rinse off all parts with clean water and dry with compressed air. If you do not have access to compressed air, place the cleaned parts on a piece of newspaper and allow to dry.

1. Clean all parts, except rubber or plastic parts, in a good grade of aerosol carburetor cleaner or cleaning solvent.

NOTE

A special carburetor cleaner is ***not*** *usually necessary to clean a carburetor unless it is very dirty or corroded. A good grade of parts cleaning solvent will usually clean most carburetors sufficiently.*

CAUTION

Do not put non-metallic parts such as floats, gaskets and O-rings in the special carburetor cleaner as these components will be damaged. Clean these components in common solvent or kerosene.

2. Remove all parts from the cleaner and wash thoroughly in soap and water. Rinse with clean water and dry thoroughly.

CAUTION

If compressed air is not available, allow the parts to air dry or use a clean lint-free cloth. Do not use paper towels to dry carburetor parts, as small paper particles may plug openings in the carburetor body or jets.

3. Blow out the jets with compressed air. *Do not* use a piece of wire to clean them as minor gouges in the jet can alter flow rate and upset the fuel/air mixture. If compressed air is not available, use a clean piece of straw from a broom to clean the jets.

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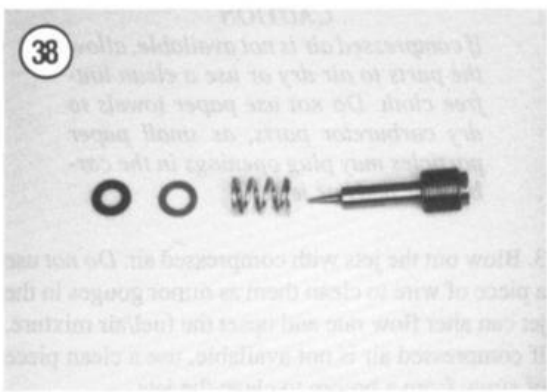
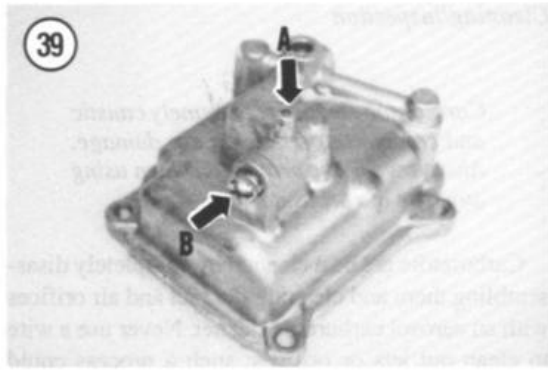
4. Make sure the small openings in the main jet nozzle, pilot jet and main jet (**Figure 37**) are clean and open.
5. Inspect the pilot screw assembly (**Figure 38**) for wear or damage. Replace defective parts.
6. Be sure to clean out the float bowl overflow tube from both ends (A, **Figure 39**).
7. Remove the float bowl drain screw (B, **Figure 39**) and make sure the opening is clear.

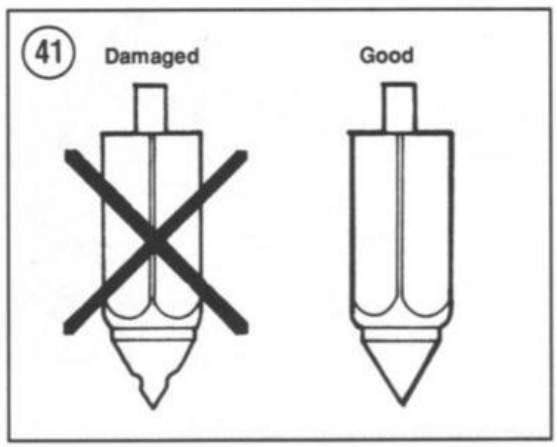
NOTE

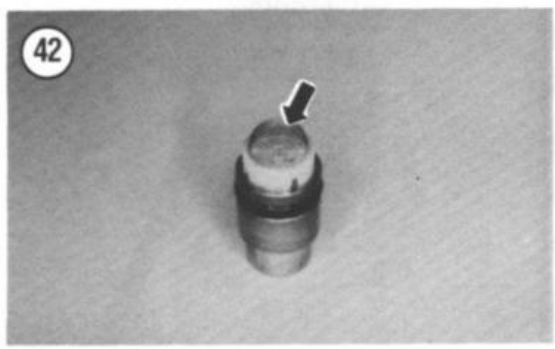
O-ring seals tend to become hardened after prolonged use and heat and therefore lose their ability to seal properly. Inspect all O-rings and replace if necessary.

8. Remove the O-ring gasket (B, **Figure 21**) from the float bowl and install a new gasket.
9. Inspect the tip of the float valve (**Figure 40**) for wear or damage. Compare to **Figure 41**. Replace the valve and seat as a set.
10. Inspect the float valve seat filter screen (**Figure 42**) for damage or any openings. Replace the screen.





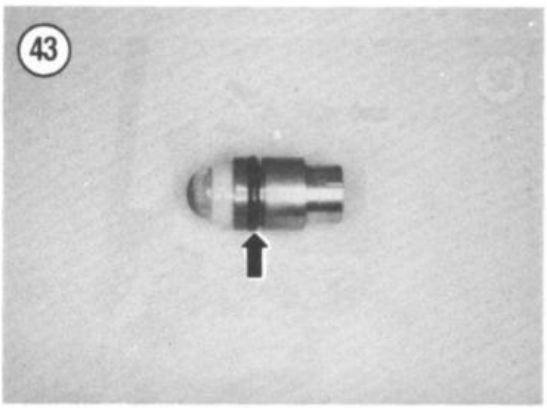


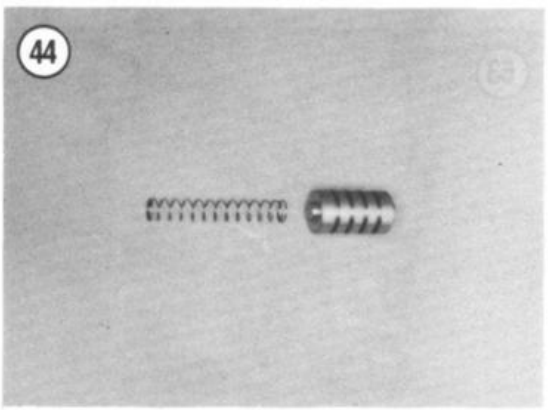


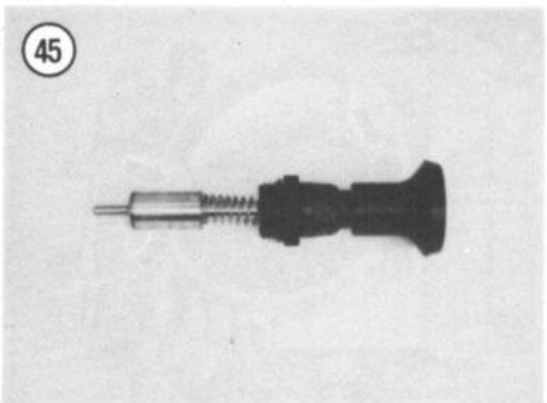
Inspect the O-ring seal (**Figure 43**) for deterioration or hardness, replace if necessary.

11. Inspect the accelerator plunger and spring (**Figure 44**) for wear or damage. Check the spring for sagging. Replace as necessary.

12. Inspect the choke assembly (**Figure 45**). Move the knob in and out and make sure it operates smoothly. Replace as an assembly if necessary.



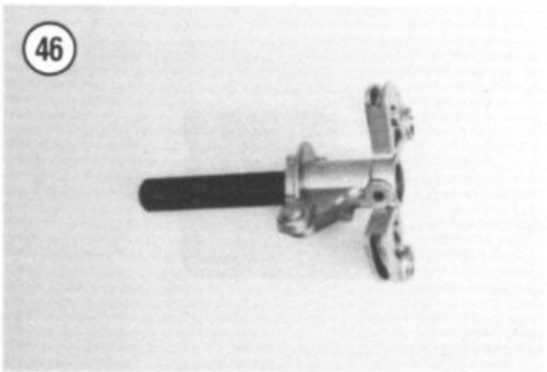


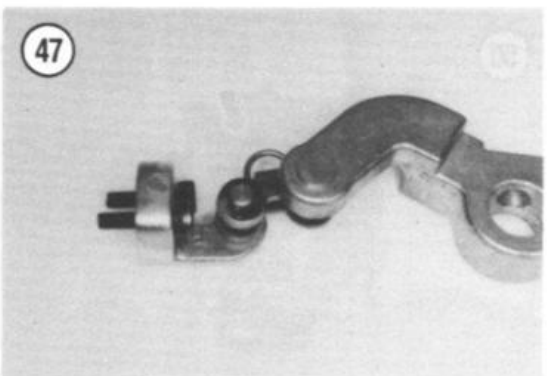


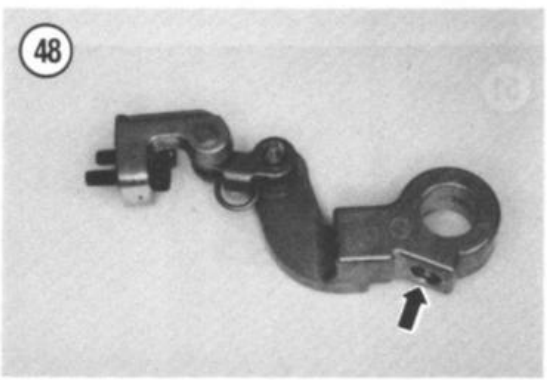
13. Inspect the throttle lever shaft (**Figure 46**) for wear or damage. Replace if necessary. Also check the pivot area (C, **Figure 34**) in the carburetor body where the shaft rides for wear or damage.

14. Inspect the throttle lever bracket assembly (**Figure 47**). Make sure it moves freely with no binding. Disassemble if necessary and replace the defective part(s).

15. Check the throttle lever bracket bolt hole threads (**Figure 48**) for wear or damage. Clean out with the correct size metric thread tap if necessary.







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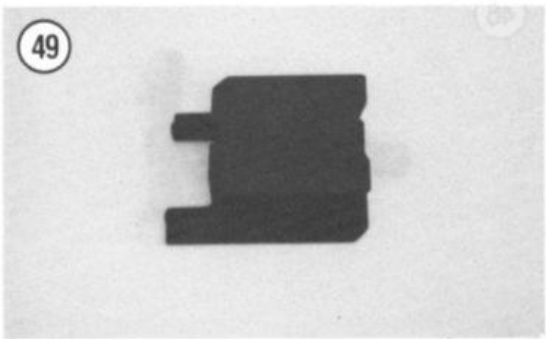
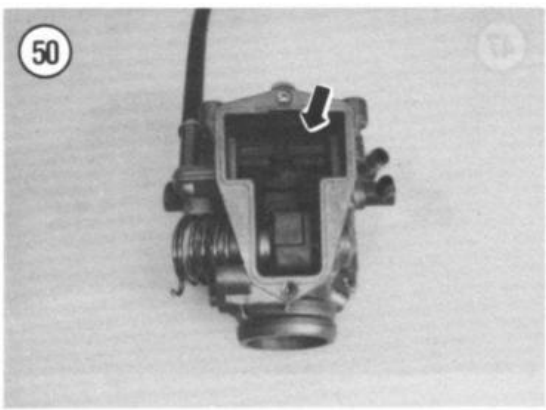
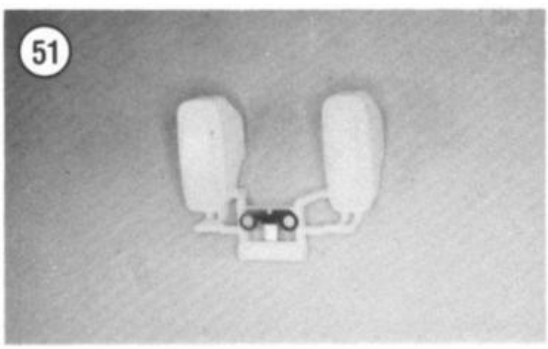
16. Inspect the throttle valve (**Figure 49**) for distortion, scratches or other damage that would allow it to stick open during engine operation. If the valve shows signs of abnormal wear, also check the carburetor body where the valve moves up and down (**Figure 50**) for wear or damage. If necessary, replace the carburetor assembly as the body is not available separately.

17. Check the float (**Figure 51**) for leaks. Fill the float bowl with water and try to push the float down. There should be no signs of bubbles. Replace the float if it leaks.



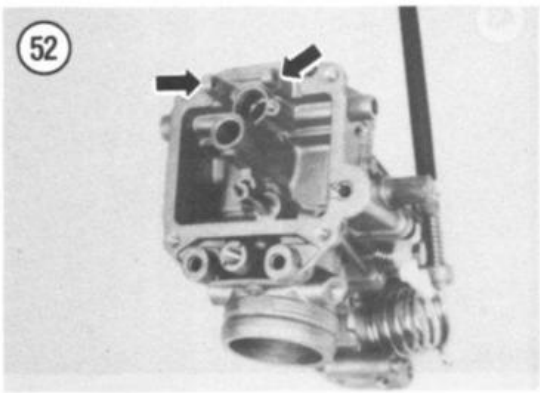


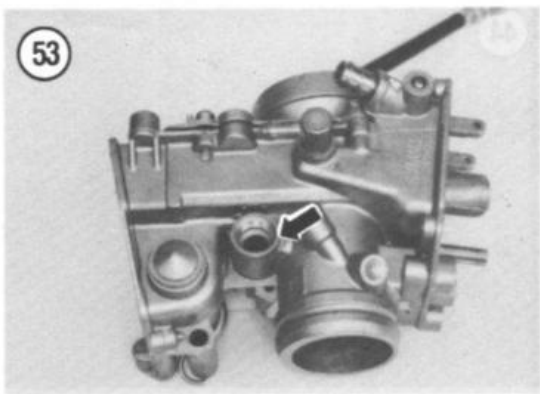


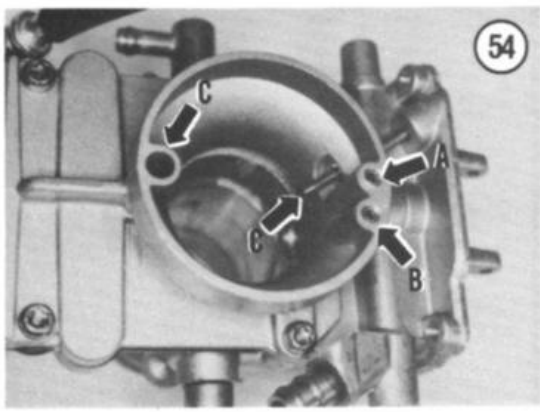
18. Inspect the float pivot pin posts (**Figure 52**) for cracks or damage. If any damage is noted, replace the carburetor assembly.

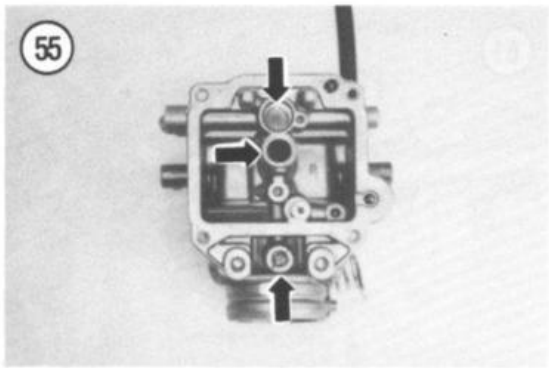
19. Check the choke assembly threaded hole (**Figure 53**) for wear or damage. Clean out with the correct size metric thread tap if necessary.

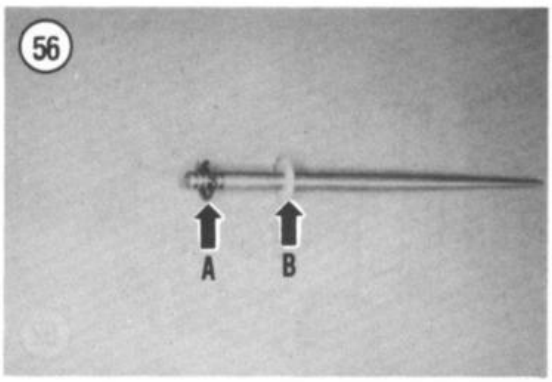
20. Do not remove the main air jet (A, **Figure 54**) nor the pilot air jet (B, **Figure 54**). Make sure they are open and clear.

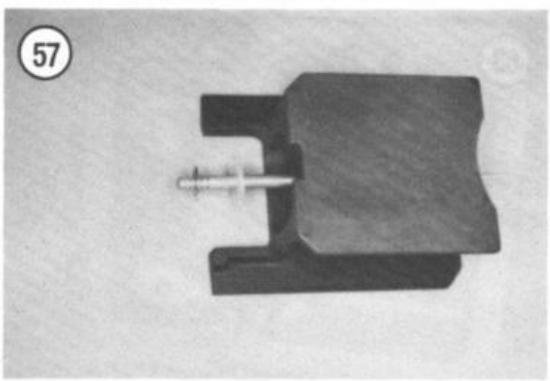


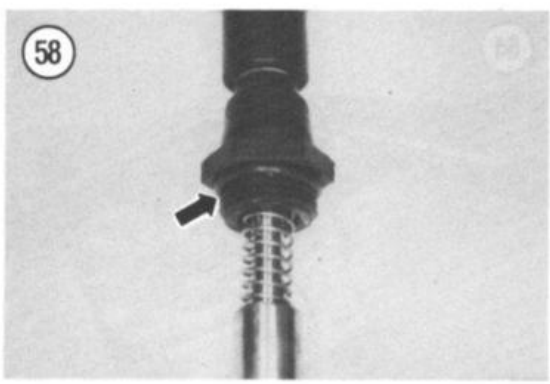










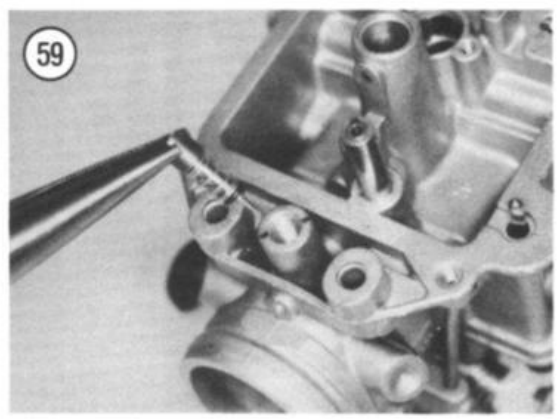


21. Make sure all openings in the carburetor body are clear. Clean out if they are plugged in any way. Refer to C, **Figure 54** and **Figure 55**.

Assembly

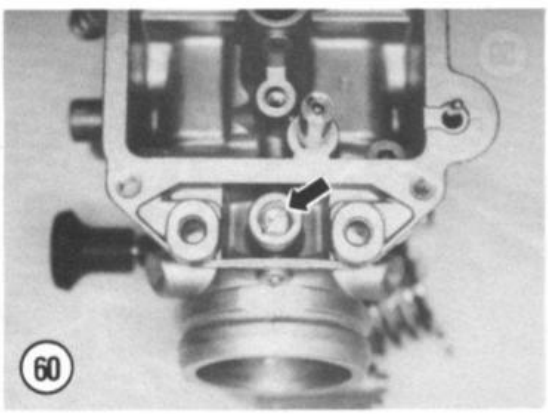
Refer to **Figure 7** for this procedure.

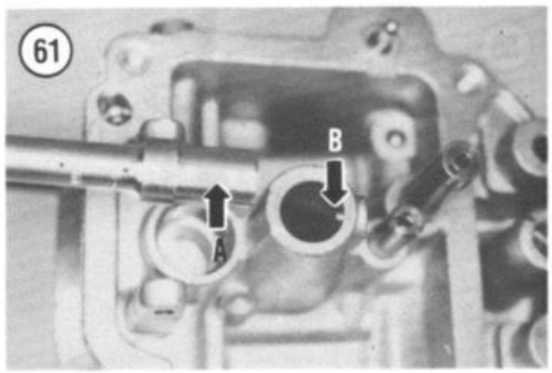
1. If removed, install the accelerator rod (D, **Figure 35**) and rubber boot (C, **Figure 35**) into the carburetor body. Correctly place the spring onto the post and install the accelerator lever onto the post and spring. Install the special bolt (A, **Figure 35**) and tighten securely.
2. Screw the idle adjust screw and cable assembly (A, **Figure 34**) into the threaded post (B, **Figure 34**) on the carburetor body.
3. To assemble the throttle valve, perform the following:
   a. Make sure the clip (A, **Figure 56**) is in the correct groove in the jet needle, refer to **Table 1** for correct location.
   b. Install the washer (B, **Figure 56**) onto the jet needle.
   c. Install the jet needle assembly (**Figure 57**) into the throttle valve.
   d. Install the Phillips screws onto the throttle valve bracket (**Figure 32**).
   e. Install the throttle valve bracket (A, **Figure 31**) into the throttle valve (B, **Figure 31**). Align the screw holes and tighten the screws securely.
4. Make sure the O-ring seal (**Figure 58**) is in place and install the choke assembly (**Figure 30**). Tighten securely.
5. Install the spring, washer and O-ring onto the pilot jet (**Figure 28**). Install the pilot jet assembly (**Figure 59**) into the receptacle in the carburetor body. Screw

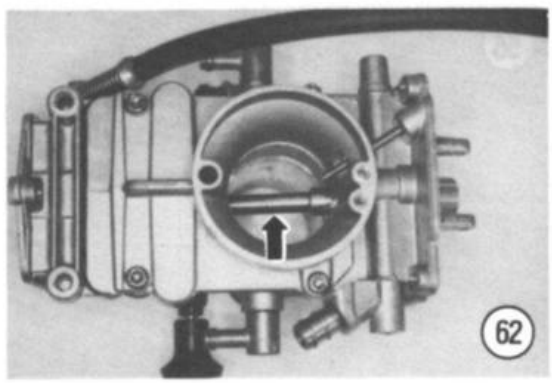


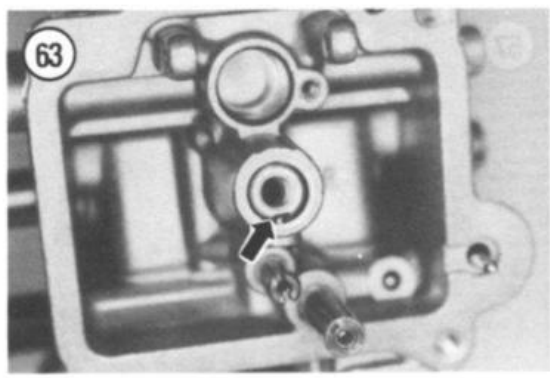
the pilot screw into the carburetor body (**Figure 60**) and position it to the same setting as noted during Step 19 of *Disassembly*.

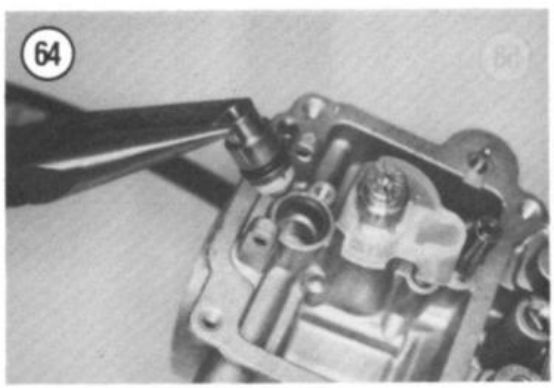
6. Install the main jet nozzle as follows:
   a. The groove (A, **Figure 61**) in the main jet nozzle must align with the pin (B, **Figure 61**) in the main jet nozzle receptacle in the carburetor body.
   b. Align the main jet nozzle groove with the pin and install the main jet nozzle (**Figure 62**) in from the top of the slide area.
   c. Carefully push the main jet nozzle into position checking to make sure the groove-to-pin alignment (**Figure 63**) is correct. Readjust if necessary, then push the main jet nozzle all the way in until it is completely seated (**Figure 26**).
7. Install the collar and baffle assembly (**Figure 25**).
8. Install the main jet (**Figure 24**) and tighten securely.
9. Make sure the O-ring seal is in place and install the valve seat (**Figure 64**) into the carburetor body. Push the valve seat down until it bottoms out.
10. Install the valve seat screw (A, **Figure 23**) and tighten securely.
11. Install the float valve (**Figure 65**) onto the float tang and install this assembly into position (B, **Figure 22**).
12. Install the float pin (A, **Figure 22**) and push it in until it stops. Use a thin drift and *carefully* tap the float pivot pin into the post. Tap it in until it is completely seated.
13. Check the float height and adjust if necessary. Refer to *Float Adjustment* in this chapter.
14. Make sure the O-ring seal gasket (B, **Figure 21**) is installed in the float bowl.

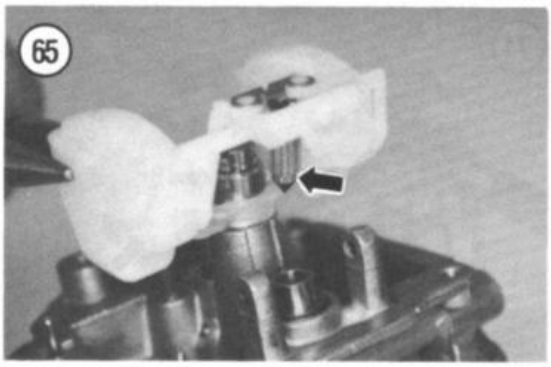


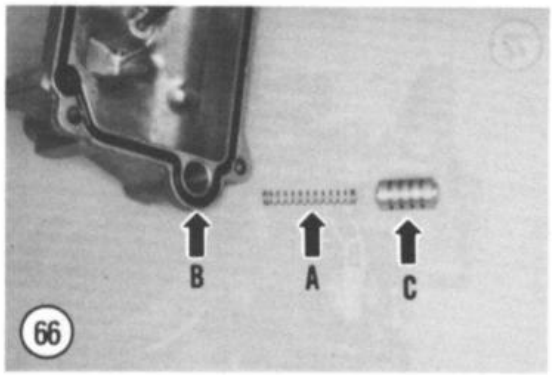


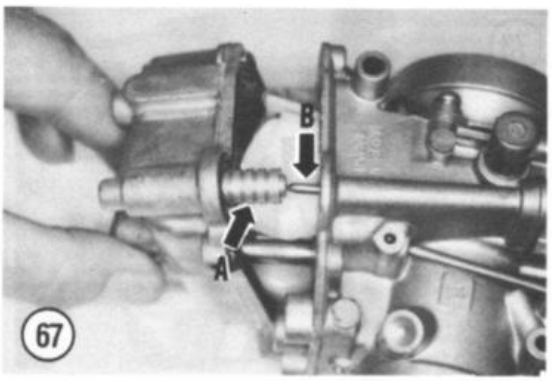


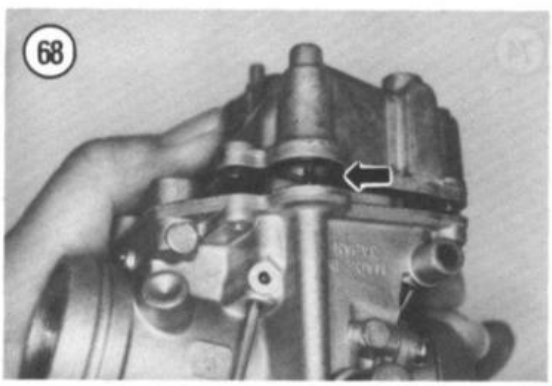




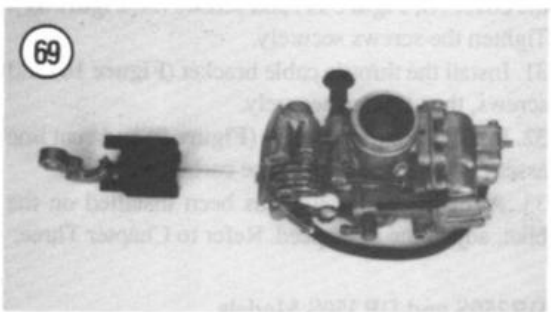


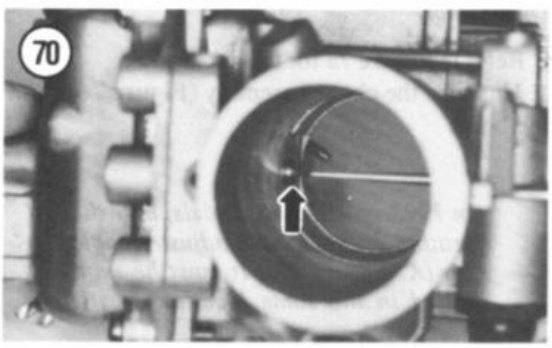






15. Install the plunger spring (A, **Figure 66**) into the receptacle in the float bowl (B, **Figure 66**).
16. Position the plunger (C, **Figure 66**) with the smaller diameter boss toward the spring. Insert the smaller boss into the end of the spring and install the plunger onto the float bowl (A, **Figure 21**).
17. Install the float bowl as follows:
    a. Hold the carburetor assembly and float bowl on its side with the plunger side facing up.
    b. Align the top of the plunger (A, **Figure 67**) with the end of the accelerator rod (B, **Figure 67**) and push the float bowl into place.
    c. Make sure the 2 parts are still aligned (**Figure 68**), then push the float bowl all the way on and hold it in place until 2 screws are installed.
18. Install the 2 screws that do not hold either the idle adjust screw bracket or the strap. Tighten the screws securely.
19. Correctly position the idle adjust screw cable bracket (**Figure 17**) and the electrical wire strap (**Figure 18**) and install the remaining float bowl screws.
20. Securely tighten the screws securing the float bowl (**Figure 19**) in a criss cross pattern.
21. Install the throttle valve assembly (**Figure 69**) into the carburetor body. Guide the end of the jet needle into the opening in the main jet nozzle (**Figure 70**) and push





the throttle valve assembly all the way in (**Figure 16**).

22. Make sure the spring (C, **Figure 15**) is in place and start the throttle lever shaft (A, **Figure 15**) into the carburetor body.

23. Place the plastic washer (**Figure 14**) in the correct position and push the throttle lever shaft through the throttle lever—then stop.

24. Move the accelerator lever down (A, **Figure 71**) so it clears the boss on the throttle lever shaft (B, **Figure 71**).

25. Make sure the return spring is positioned correctly on the carburetor body post (A, **Figure 72**) and is correctly hooked onto the pin (B, **Figure 72**) on the throttle lever shaft.

26. Push the throttle lever shaft the rest of the way in until it stops.

27. Make sure the accelerator lever is riding on the roller (**Figure 73**) on the backside of the boss. Rotate the throttle lever shaft back and forth and check for proper operation. This alignment is necessary for proper accelerator pump operation.

28. Make sure the plastic washer (**Figure 12**) is in place.

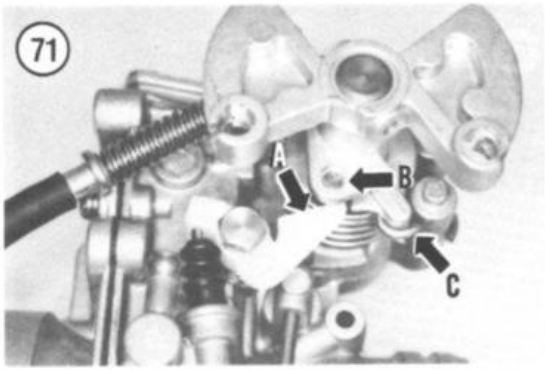
29. Align the bolt hole in the throttle valve bracket and the shaft and install the bolt and washer (**Figure 13**). Tighten the bolt securely.

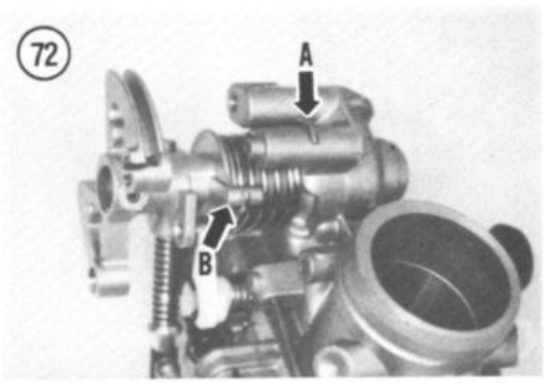
30. Install a new cover gasket (**Figure 74**) and install the cover (B, **Figure 11**) and screws (A, **Figure 11**). Tighten the screws securely.

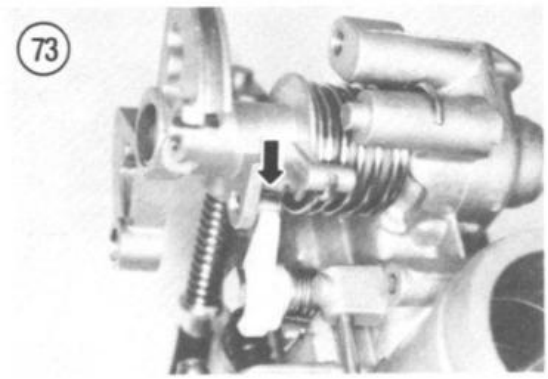
31. Install the throttle cable bracket (**Figure 10**) and screws, then tighten securely.

32. Install the overflow line (**Figure 9**) and vent line assembly (**Figure 8**) onto the carburetor.

33. After the carburetor has been installed on the bike, adjust the idle speed. Refer to Chapter Three.







DR250S and DR350S Models

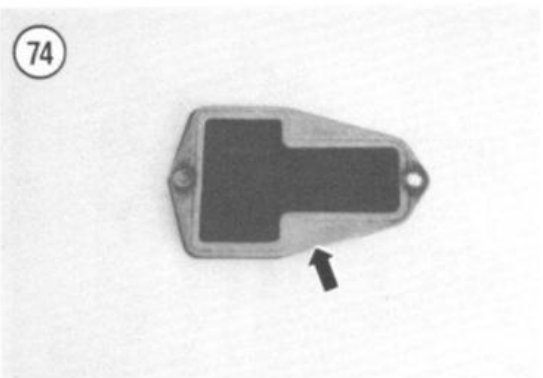
Disassembly

Refer to **Figure 75** for this procedure.

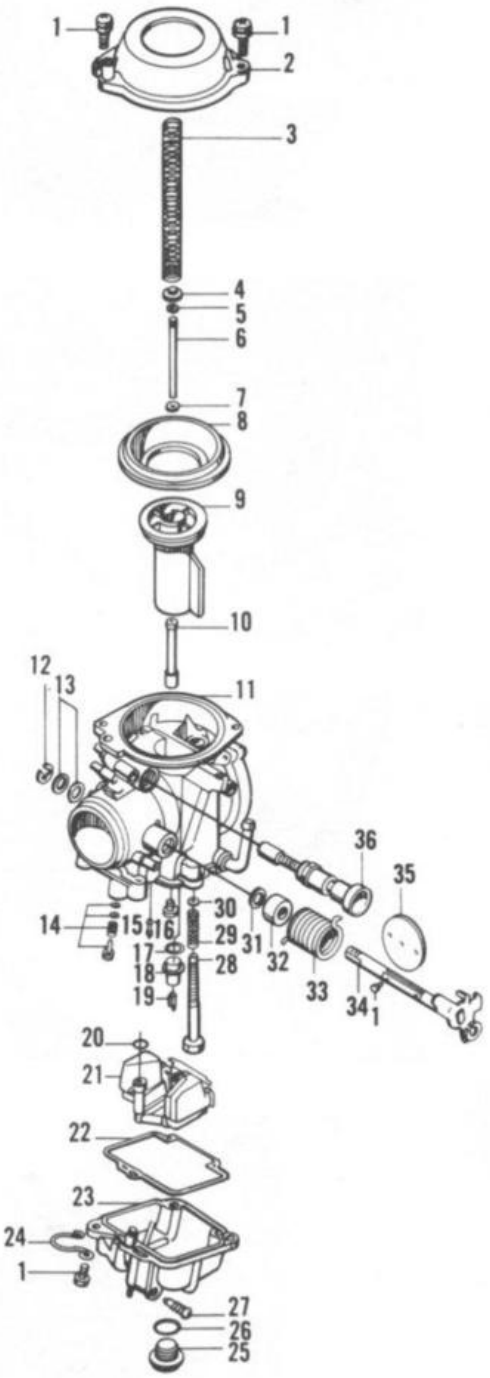
1. Unscrew the choke assembly (**Figure 76**) from the body.

NOTE

*On 1993-on DR250S models, note the location of the throttle adjuster cable clip (A, **Figure 77**). It must be reinstalled in the same location during assembly.*



(75) CARBURETOR (DR250S AND DR350S)



1. Screw
2. Cover
3. Spring
4. Ring clip
5. E-ring
6. Jet needle
7. Washer
8. Diaphragm
9. Piston slide
10. Main jet nozzle
11. Carburetor body
12. E-clip
13. Gaskets
14. Pilot jet assembly
15. Air jet
16. Main jet
17. O-ring
18. Float valve seat
19. Float valve
20. O-ring
21. Float assembly
22. O-ring gasket
23. Float bowl
24. Cable clamp
25. Plug
26. O-ring
27. Drain screw
28. Idle adjust knob
29. Spring
30. Washer
31. Gasket
32. Spacer
33. Spring
34. Throttle valve shaft
35. Throttle valve
36. Choke assembly

8

2. Remove the screws securing the float bowl (B, **Figure 77**), then remove the float bowl and gasket.

3. Remove the float and the float valve assembly (**Figure 78**).

4. Remove the pilot jet (**Figure 79**).

5. Use needlenose pliers and carefully remove the float valve seat (**Figure 80**).

6. Remove the screws securing the top cover and remove the cover (**Figure 81**).

7. Remove the diaphragm spring (A, **Figure 82**) and diaphragm/piston slide assembly (B, **Figure 82**).

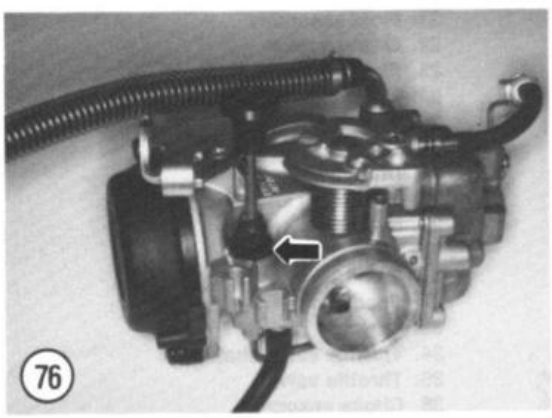
8. Remove the main jet (**Figure 83**) and the main jet nozzle (**Figure 84**).

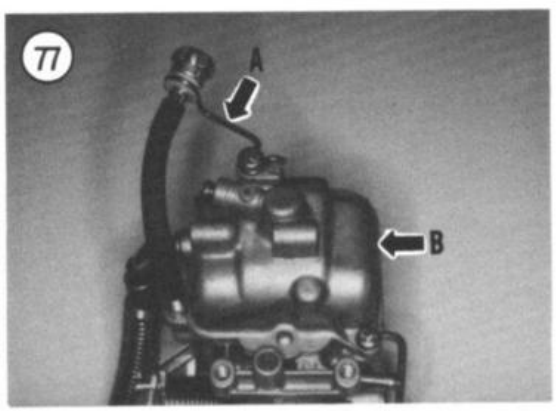
9. Carefully slide the piston slide guide (**Figure 85**) out of the body.

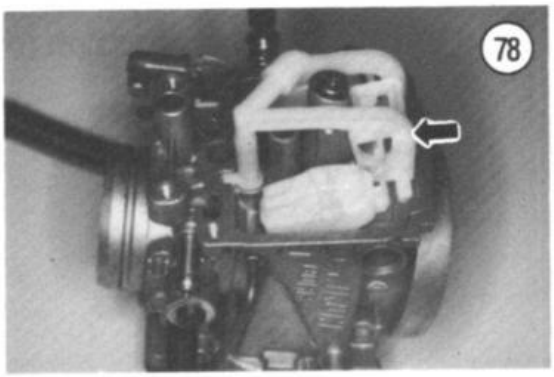
10. Disassemble the piston slide assembly as follows:

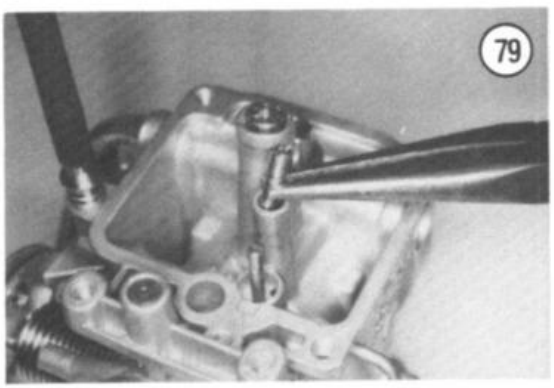
a. Use needlenose pliers and remove the ring clip (**Figure 86**) from the end of the jet needle.

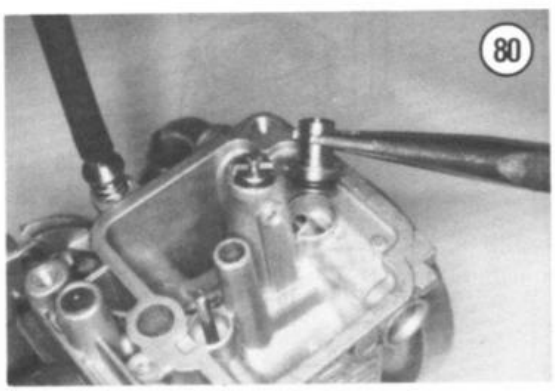
b. Use needlenose pliers and remove the jet needle (**Figure 87**) from the piston slide.

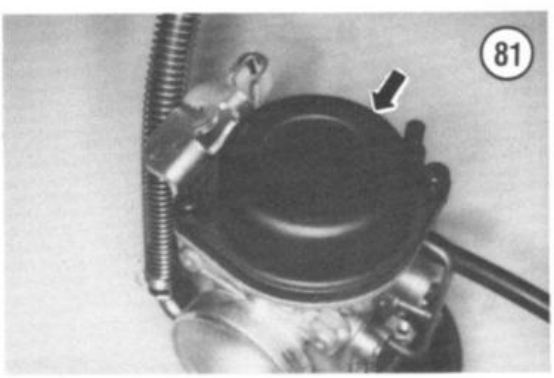


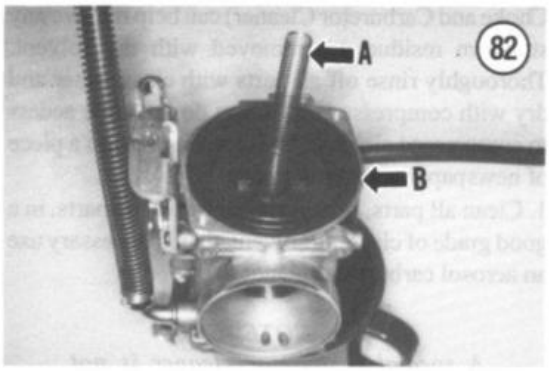










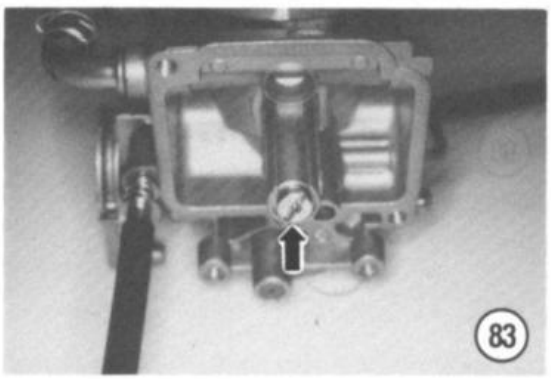


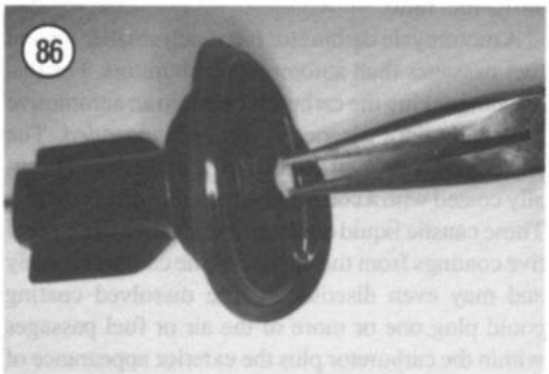
NOTE

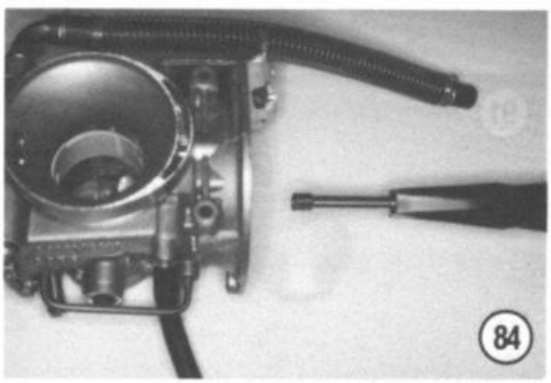
The following steps are not usually required for routine carburetor cleaning and are ***not*** *removed for this procedure. They may require removal at some time if one of them malfunctions or is damaged.*

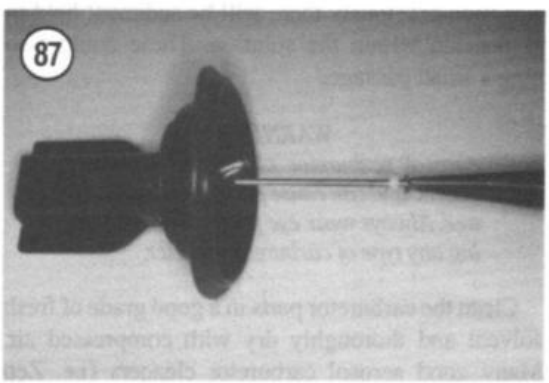
11. Unscrew the throttle adjust screw and spring (A, **Figure 88**).

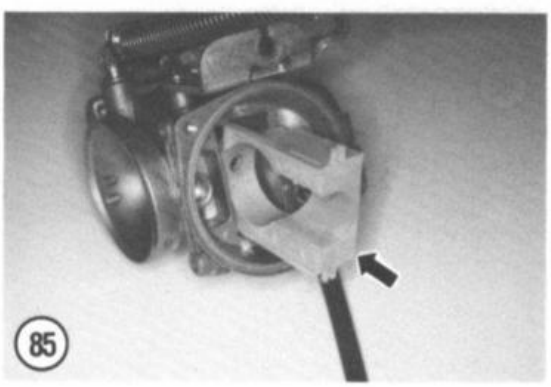
12. If necessary, remove the screws and remove the throttle cable bracket (B, **Figure 88**).

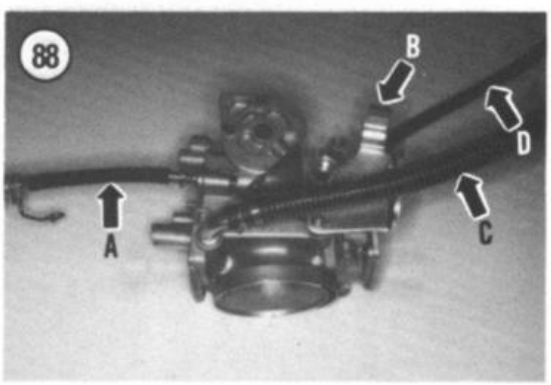












13. Disconnect the fuel inlet hose (C, **Figure 88**) and vacuum line (D, **Figure 88**) from the body.
14. Clean and inspect the carburetor assembly components as described in this chapter.

Cleaning/inspection

A carburetor is best cleaned by completely disassembling it and cleaning the fuel and air orifices with an aerosol carburetor cleaner. Never use a wire to clean out jets or orifices; such a process could enlarge the passage which would adversely affect the air-to-fuel ratio.

A motorcycle carburetor has much smaller air and fuel passages than automotive carburetors. For this reason, soaking the carburetor parts in an automotive type carburetor cleaner is *not recommended*. The exterior of nearly all motorcycle carburetors is usually coated with a corrosion-protective clear coating. These caustic liquid cleaners will remove the protective coatings from the outside of the carburetor body and may even discolor it. The dissolved coating could plug one or more of the air or fuel passages within the carburetor plus the exterior appearance of the carburetors will be damaged. Also, if the cleaner was used previously there will be sediment held in suspension within the solution. These could also plug a small passage.

WARNING

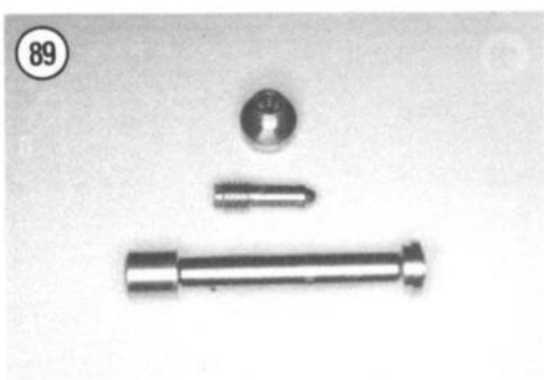
Aerosol carburetor cleaner is extremely caustic and can cause permanent eye damage. Always wear eye protection when using any type of carburetor cleaner.

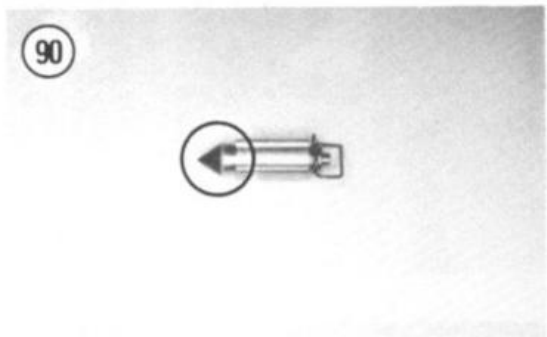
Clean the carburetor parts in a good grade of fresh solvent and thoroughly dry with compressed air. Many good aerosol carburetor cleaners (i.e. Zep Choke and Carburetor Cleaner) can help remove any stubborn residue not removed with the solvent. Thoroughly rinse off all parts with clean water and dry with compressed air. If you do not have access to compressed air, place the cleaned parts on a piece of newspaper and allow to dry.

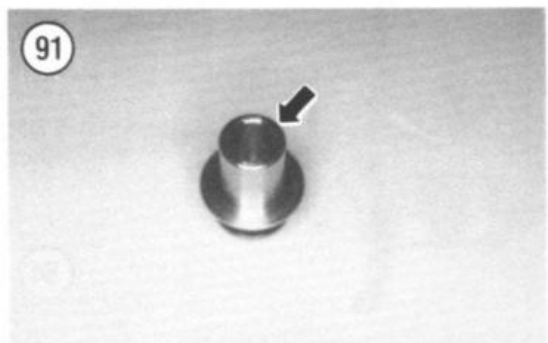
1. Clean all parts, except rubber or plastic parts, in a good grade of cleaning solvent, then if necessary use an aerosol carburetor cleaner.

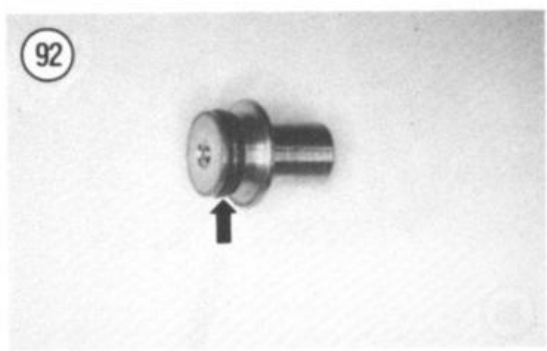
NOTE

A special carburetor cleaner is ***not*** *usually necessary to clean a carburetor unless it is very dirty or corroded. A good grade of parts cleaning solvent*







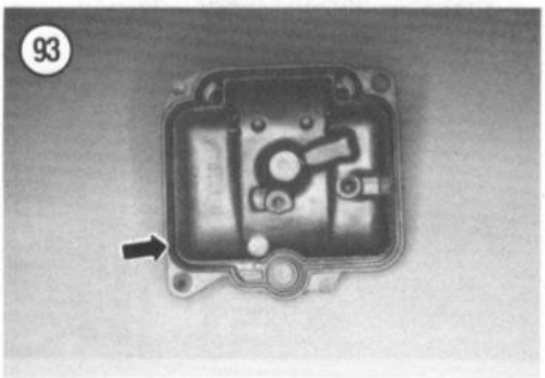


will usually clean most carburetors sufficiently.

CAUTION

Do not put non-metallic parts such as floats, gaskets and O-rings in special carburetor cleaner as these components will be damaged. Clean these components in common solvent or kerosene.

2. Remove all parts from the cleaner and wash thoroughly in soap and warm water. Rinse with clean warm water and dry thoroughly.



CAUTION

If compressed air is not available, allow the parts to air dry or use a clean lint-free cloth. Do not use paper towels to dry carburetor parts, as small paper particles may plug openings in the carburetor body or jets.

3. Blow out the jets with compressed air. *Do not* use a piece of wire to clean them as minor gouges in the jet can alter flow rate and upset the fuel/air mixture. If compressed air is not available, use a piece of straw from a broom to clean the jets.

4. Make sure the small openings in the main jet nozzle, the pilot jet and main jet (**Figure 89**) are clean and open.

5. Inspect the tip of the float valve (**Figure 90**) for wear or damage. Also inspect the inner surface of the float valve seat (**Figure 91**) for wear or surface scratches. Replace the valve and valve seat as a set.

NOTE

O-ring seals tend to become hardened after prolonged use and heat and therefore lose their ability to seal properly.

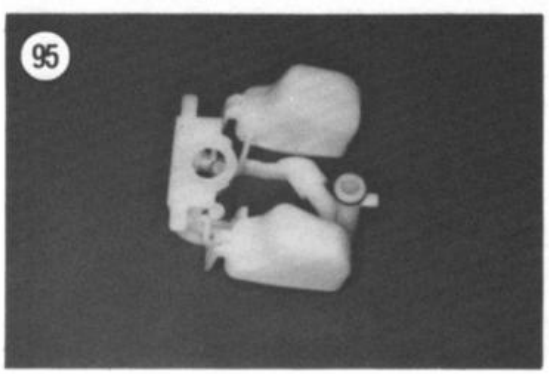
6. Install a new O-ring seal (**Figure 92**) on the valve seat.

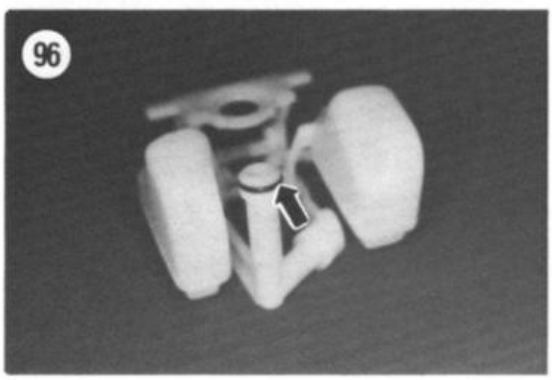
7. Remove the O-ring gasket (**Figure 93**) from the float bowl and install a new gasket.

8. Remove the drain screw (**Figure 94**) from the float bowl and make sure the drain channel is open. Clean out if necessary.

9. Check the float (**Figure 95**) for leaks. Fill the float bowl with water and try to push the float down. There should be no signs of bubbles. Replace the float if it leaks.

10. Install a new O-ring seal (**Figure 96**) on the float assembly.



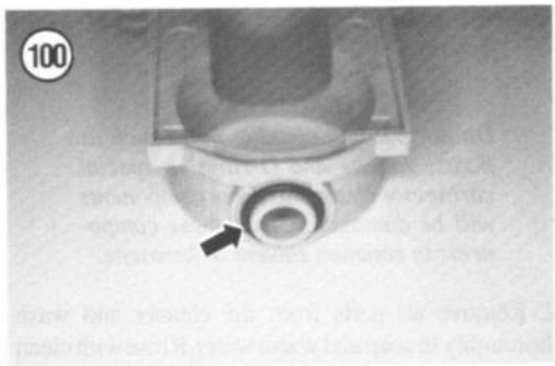


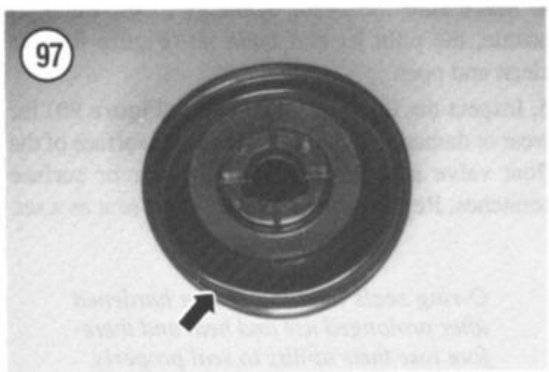
11. Inspect the diaphragm (**Figure 97**) for deterioration, tears or hardness, replace if necessary.

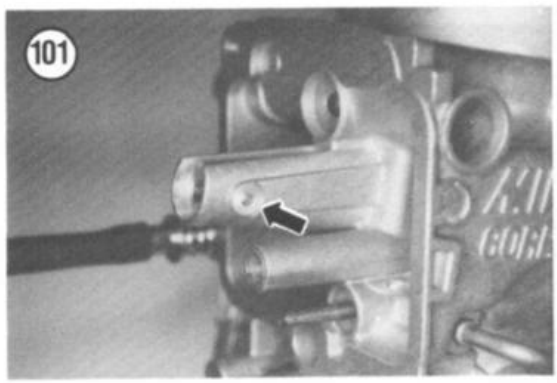
12. Check the piston slide (**Figure 98**) and piston slide guide (**Figure 99**) for scratches or other damage that would allow it to stick open during engine operation.

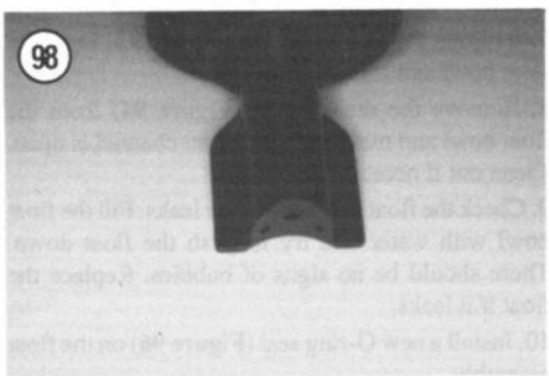
13. Install a new O-ring seal (**Figure 100**) on the base of the piston slide guide.

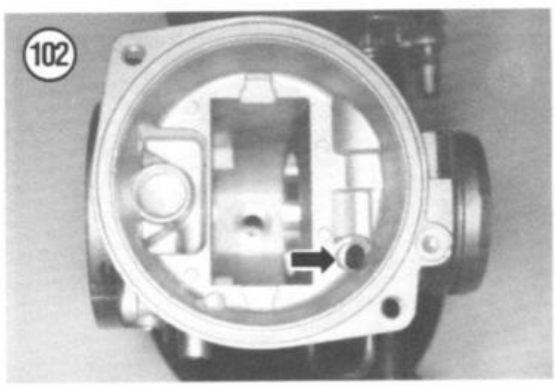
14. Inspect the float pivot pin posts (**Figure 101**) for cracks or damage. If any damage is noted, replace the carburetor assembly.

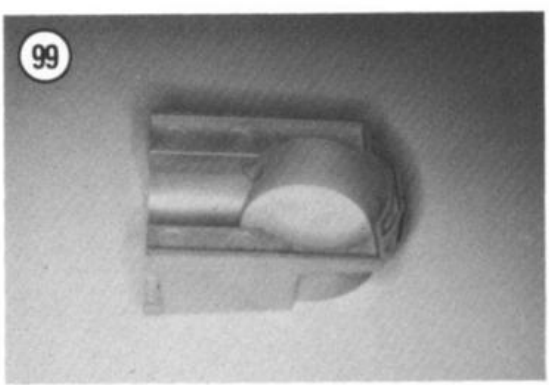


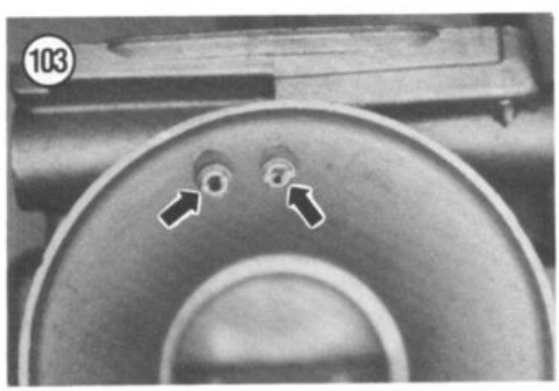


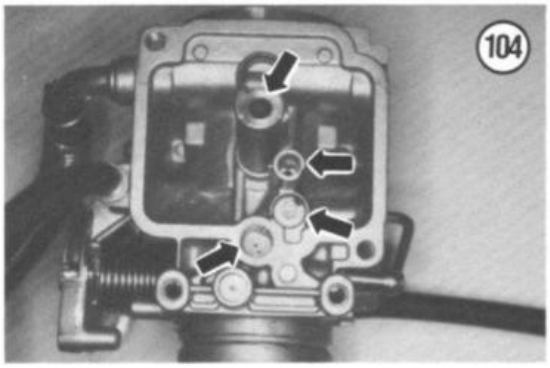


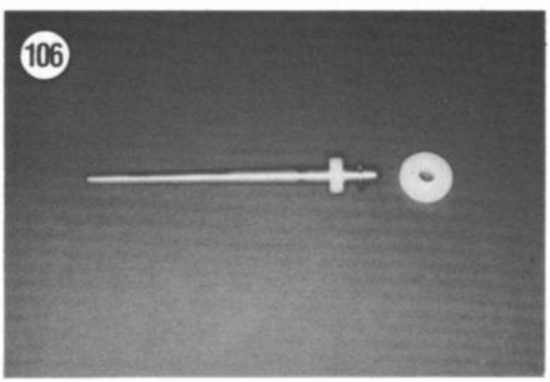


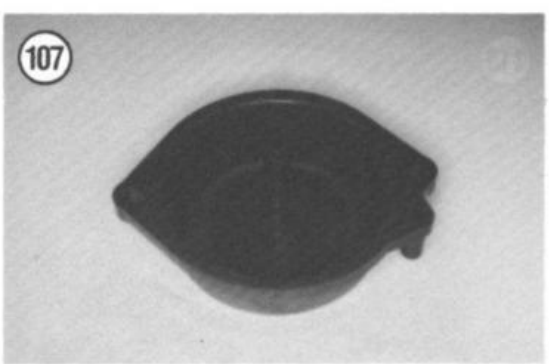












15. Blow out all passages in the carburetor body with compressed air. Refer to **Figure 102**, **Figure 103**, **Figure 104** and **Figure 105**. Clean out if they are plugged or corroded in any way.

16. Inspect the jet needle (**Figure 106**) for wear or damage, replace as necessary.

17. Inspect the inner surface of the carburetor cap (**Figure 107**) for wear or damage. Replace if necessary.

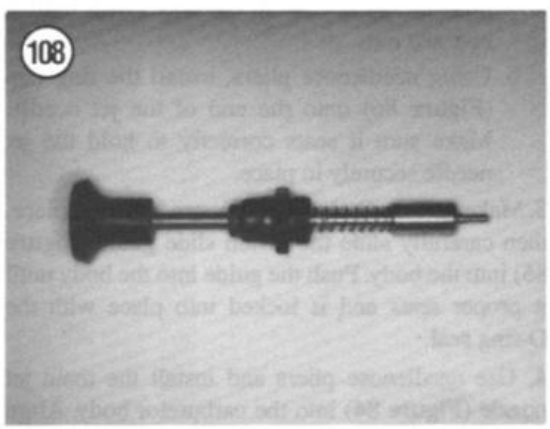
18. Inspect the choke assembly (**Figure 108**) for wear or damage. If any portion is damaged, replace as an assembly.

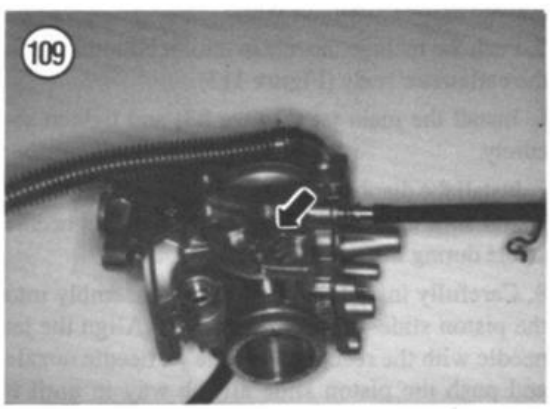
19. Check the carburetor throttle valve operation as follows:

a. Operate the throttle wheel and valve linkage (**Figure 109**) by hand.

b. The valve and shaft should turn smoothly. If the shaft is tight or damaged, replace the carburetor assembly.

c. Make sure the shaft E-clip (**Figure 110**) is secure.



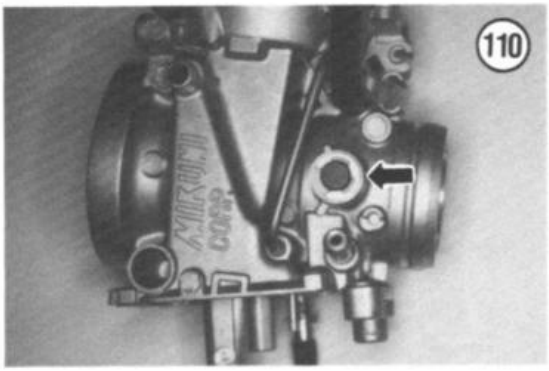


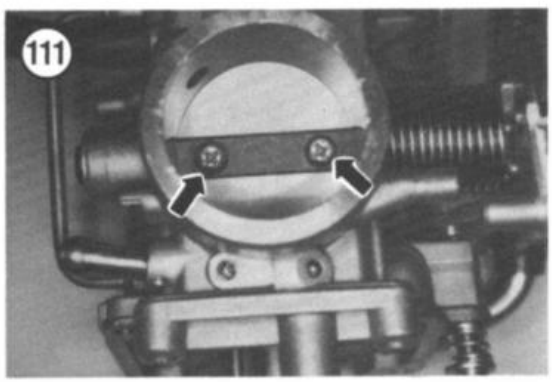
d. Make sure the screws (**Figure 111**) securing the butterfly are tight. Tighten securely if necessary.

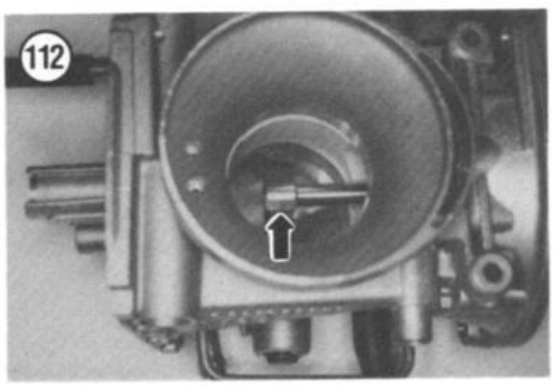
Assembly

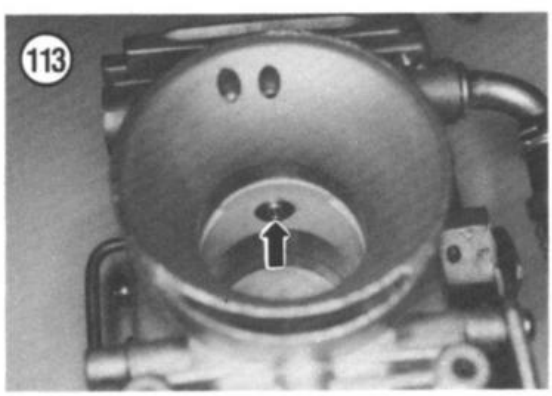
Refer to **Figure 75** for this procedure.

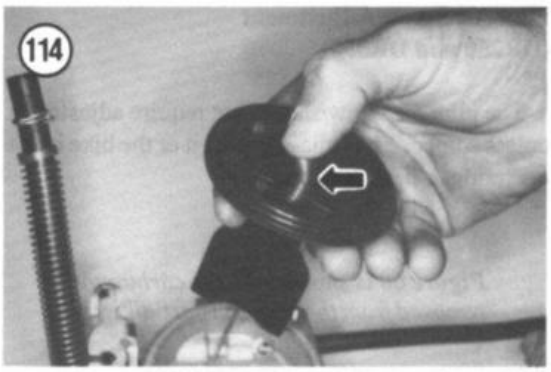
1. If the following items were removed, install them as follows:
   a. Install the throttle adjust screw and spring (A, **Figure 88**) and tighten securely.
   b. Install the throttle cable bracket (B, **Figure 88**) and screws. Tighten the screws securely.
   c. Connect the fuel inlet hose (C, **Figure 88**) and vacuum line (D, **Figure 88**) onto the body. Push the hose and vacuum line all the way on until they stop.
2. Assemble the piston slide assembly as follows:
   a. Make sure the clip and washer are in place and use needlenose pliers to install the jet needle (**Figure 87**) into the piston slide. Carefully push the jet needle all the way down until it bottoms out.
   b. Using needlenose pliers, install the ring clip (**Figure 86**) onto the end of the jet needle. Make sure it seats correctly to hold the jet needle securely in place.
3. Make sure the O-ring seal (**Figure 100**) is in place, then carefully slide the piston slide guide (**Figure 85**) into the body. Push the guide into the body until it proper seats and is locked into place with the O-ring seal.
4. Use needlenose pliers and install the main jet nozzle (**Figure 84**) into the carburetor body. Align the flat (**Figure 112**) on the nozzle with the flat surface in the carburetor body.
5. Push the main jet nozzle in until it bottoms out in the carburetor body (**Figure 113**).
6. Install the main jet (**Figure 83**) and tighten securely.
7. Install the diaphragm spring (**Figure 114**) into the piston slide assembly. This will keep the jet needle stable during installation.
8. Carefully install the piston slide assembly into the piston slide guide (**Figure 115**). Align the jet needle with the receptacle in the jet needle nozzle and push the piston slide all the way in until it stops (B, **Figure 82**).

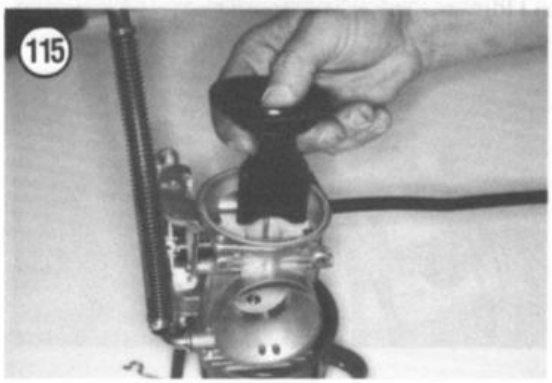


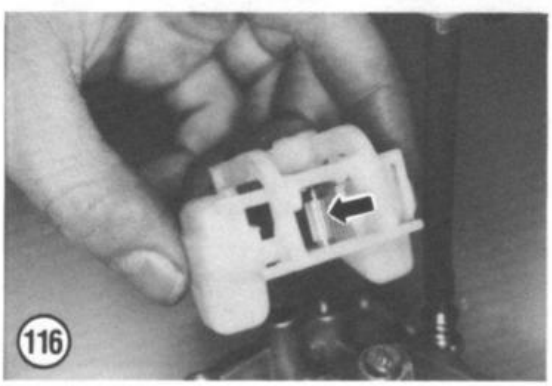


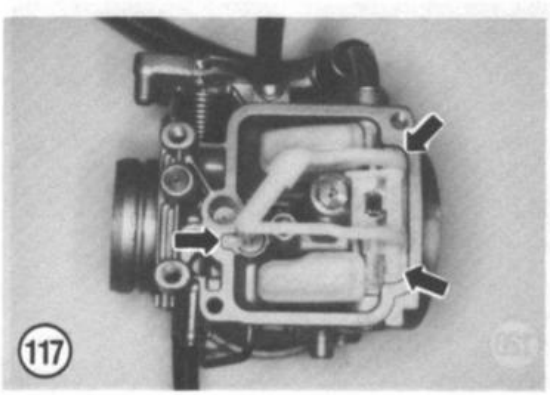












9. Make sure the spring (A, **Figure 82**) is still in place and install the top cover (**Figure 81**). Install the screws and tighten securely.
10. Make sure the O-ring seal (**Figure 92**) is in place and install the float valve seat (**Figure 80**).
11. Install the pilot jet (**Figure 79**) and tighten securely.
12. Make sure the O-ring seal (**Figure 96**) is in place on the float assembly.
13. Hook the float valve assembly (**Figure 116**) onto the float and install the float assembly (**Figure 78**). Make sure the float locating tabs are properly indexed into the locating receptacles in the carburetor body (**Figure 117**). This is necessary for proper float operation.
14. Check the float height and adjust if necessary. Refer to *Float Adjustment* in this chapter.
15. Make sure the O-ring gasket (**Figure 93**) is in place in the float bowl, then install the float bowl (B, **Figure 77**).
16. On models so equipped, install the throttle adjuster cable clip (A, **Figure 77**) into the location noted during disassembly.
17. Install the float bowl screws and tighten securely.
18. Screw the choke assembly (**Figure 76**) into the body and tighten securely.
19. After the carburetor has been installed on the bike, adjust the idle speed. Refer to Chapter Three.

CARBURETOR ADJUSTMENTS

Float Adjustment

The fuel level in the carburetor float bowl is critical to proper performance. The fuel flow rate from the bowl up to the carburetor bore depends not only on the vacuum in the throttle bore and the size of the jets, but also upon the fuel level within the float bowl.

DR250 and DR350

1. Remove the carburetor as described in this chapter.
2. Remove the float bowl as described in the *Disassembly* procedure in this chapter.
3. Hold the carburetor so the float arm is just touching the float needle—not pushing it down. Use a float level gauge, vernier caliper or small ruler (**Fig-**

ure 118) and measure the distance from the carburetor body to the float. The correct height is listed in **Table 1**.

4. If adjustment is necessary, use a thin drift and carefully tap the float pivot pin (A, **Figure 22**) out of the posts. Remove the float and float valve (B, **Figure 22**).

5. Adjust the float by *carefully* bending the tang (**Figure 119**) with a screwdriver.

6. Install the float valve (**Figure 65**) onto the float tang and install this assembly into position (B, **Figure 22**).

7. Install the float pin (A, **Figure 22**) and push it in until it stops. Use a thin drift and *carefully* tap the float pivot pin into the post.

8. Install the float bowl as described in the *Assembly* procedure in this chapter.

9. Install the carburetor as described in this chapter.

DR250S and DR350S

1. Remove the carburetor as described in this chapter.

2. Remove the float bowl as described in the *Disassembly* procedure in this chapter.

3. Hold the carburetor so the float arm is just touching the float needle—not pushing it down. Use a float level gauge, vernier caliper or small ruler and measure the distance from the carburetor body to the float. The correct height is listed in **Table 1**.

4. Remove the float assembly from the carburetor body.

5. Adjust the float by *carefully* bending the tang (**Figure 120**) with a screwdriver.

6. Make sure the O-ring seal (**Figure 96**) is in place on the float assembly.

7. Hook the float valve assembly (**Figure 116**) onto the float and install the float assembly (**Figure 78**). Make sure the float locating tabs are properly indexed into the locating receptacles in the carburetor body (**Figure 117**). This is necessary for proper float operation.

8. Install the float bowl as described in the *Assembly* procedure in this chapter.

9. Install the carburetor as described in this chapter.

Idle Speed Adjustment

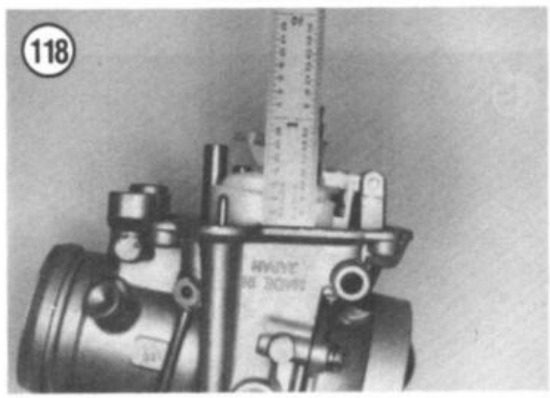
Refer to Chapter Three.

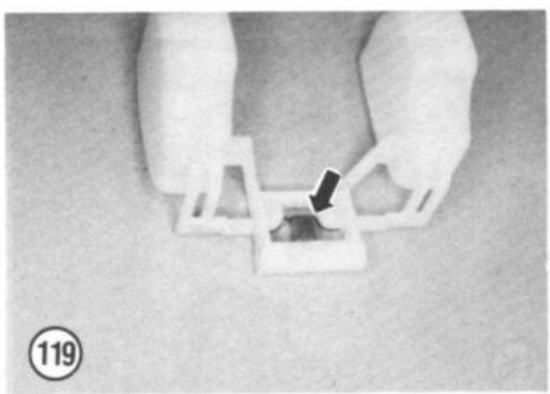
Pilot Air Screw Adjustment (DR250 and DR350)

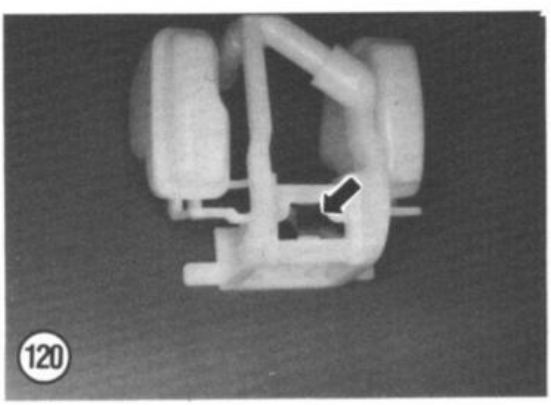
The pilot air screw should not require adjustment unless someone has mis-adjusted it or the bike is not operating at peak performance.

NOTE

***Figure 60** is shown with the carburetor removed from the bike and partially dis-*







assembled for clarity. Do not remove the carburetor for this procedure.

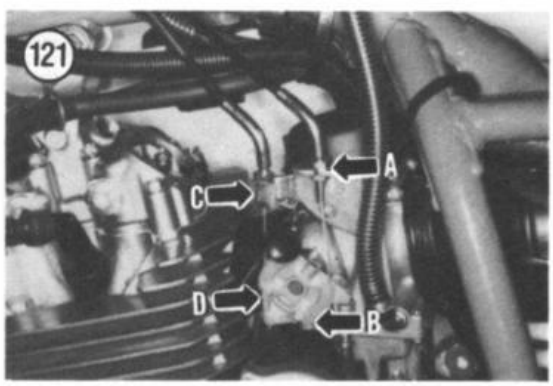
If adjustment is necessary, carefully screw the pilot air screw (**Figure 60**) in until it **lightly** seats, then back it out the number of turns listed in **Table 1**.

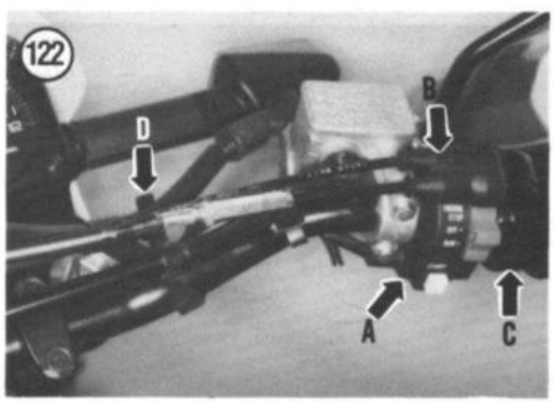
Pilot Air Screw Adjustment (DR250S and DR350S)

The pilot air screw is pre-set at the factory and is fixed in a blind housing and removal is not recommended as the housing plug must be removed.

High Altitude Adjustment (Main Jet Replacement)

Suzuki does not provide any main jet specifications for changing the main jet while riding in high elevations. If the bike is ridden in high elevations (above 5,000 ft./1,500 m) and the bike is not performing as expected, talk to a service technician at your local Suzuki dealer for guidance.





THROTTLE CABLE REPLACEMENT

The carburetor used on 1990-1991 DR250S and 1990-1991 DR350S models is equipped with a single throttle cable setup. All other models are equipped with a dual throttle cable setup.

On dual cable models, one cable is a "pull" cable and the other is a "push" cable. At the throttle grip, the "push" cable (front cable) is located next to the master cylinder body and the "pull" cable (rear cable) is closer to the rider. At the carburetor throttle wheel, the "push" cable is located in the front slot in the throttle wheel and the "pull" cable is located in the rear slot in the throttle wheel.

Removal/Installation

NOTE

This procedure is shown on a model with dual throttle cables.

1. Place wood block(s) under the engine to support the bike securely.
2. Remove the seat as described in Chapter Thirteen.
3. Remove the fuel tank as described in this chapter.

4A. On single throttle cable models, perform the following at the carburetor:

a. Loosen the throttle cable locknuts and disconnect the throttle cable from the throttle wheel.
b. Remove the cable from the bracket on the carburetor body.

4B. On dual throttle cable models, perform the following at the carburetor:

a. Loosen the No. 1 "pull" throttle cable adjuster locknuts (A, **Figure 121**) and disconnect the throttle cable (B, **Figure 121**) from the throttle wheel on the carburetor assembly.
b. Loosen the No. 2 throttle "push" cable adjuster locknuts (C, **Figure 121**) and disconnect the throttle cable (D, **Figure 121**) from the throttle wheel on the carburetor assembly.

5. Remove the screws holding the right-hand switch housings together (A, **Figure 122**).
6. Separate the switch housing and move it off the handlebar.
7. Slide the rubber boot (B, **Figure 122**) off the throttle cable(s).
8. Remove the screws holding the throttle case together (C, **Figure 122**).
9. Separate the throttle case and move it off the handlebar.

10. Disconnect the throttle cable(s) from the throttle grip assembly.

11. Disconnect the throttle cable(s) from the plastic clip (D, **Figure 122**) on the handlebar.

NOTE

The piece of string attached in the next steps will be used to pull the new throttle cable(s) back through the frame so it will be routed in exactly the same position as the old cable.

12. Tie a piece of heavy string or cord (approximately 3 ft./1 m. long) to the carburetor end of the throttle cable(s). Wrap this end with masking or duct tape. Do not use a lot of tape as it must be pulled through the frame during removal. Tie the other end of the string to the engine or frame.

13. At the throttle grip end of the cable, carefully pull the cable(s) and attached string out through the frame. Make sure the attached string follows the same path as the cable(s) through the frame.

14. Remove the tape and untie the string from the old cable.

15. Lubricate the new cable(s) as described in Chapter Three.

16. Tie the string to the carburetor end of the new throttle cable(s) and wrap it with tape.

17. Carefully pull the string back through the frame routing the new cable(s) through the same path as the old cable(s).

18. Remove the tape and untie the string from the cable(s) and the frame.

19. Connect the new throttle cables by reversing Steps 2-11 and while noting the following:

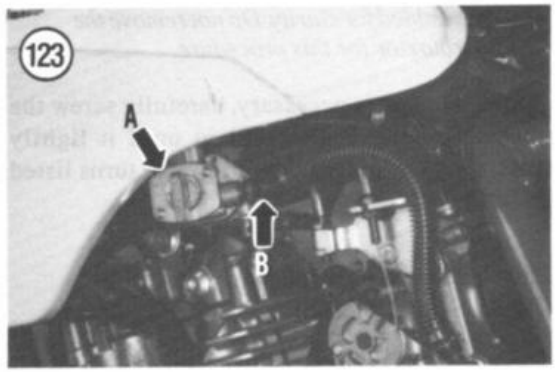
a. Operate the throttle grip and make sure the throttle cable(s) and linkage are operating correctly, with no binding. If operation is incorrect or there is binding, carefully check that the cable(s) are attached correctly and there are no tight bends in the cables.

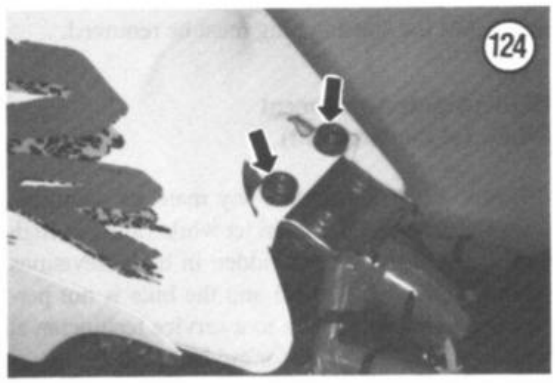
b. Install the fuel tank as described in this chapter.

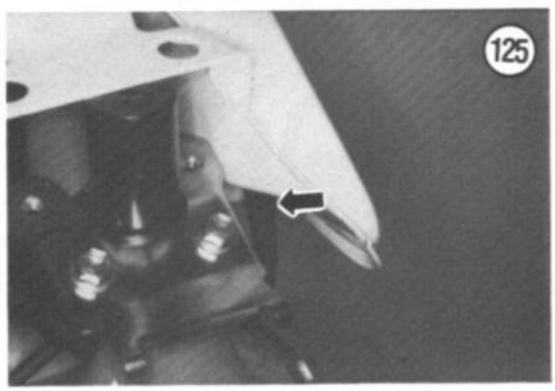
c. Install the seat.

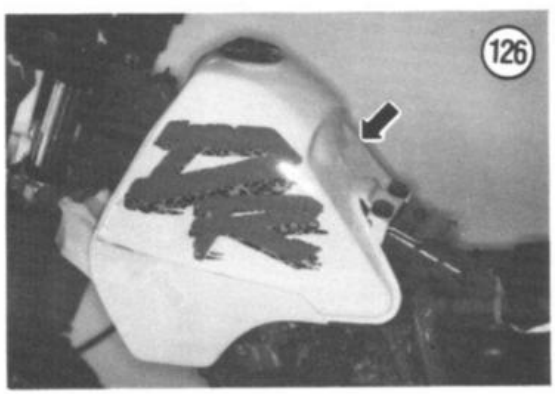
d. Adjust the throttle cable(s) as described in Chapter Three.

e. Test ride the bike slowly at first and make sure the throttle is operating correctly.





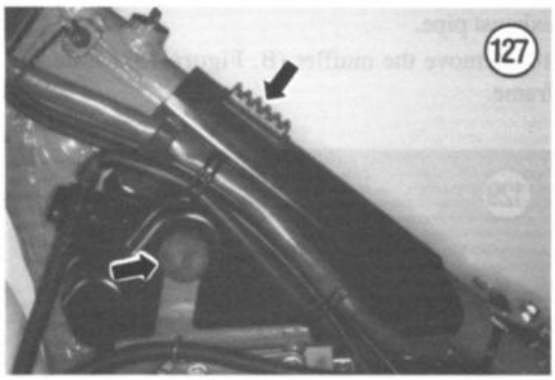


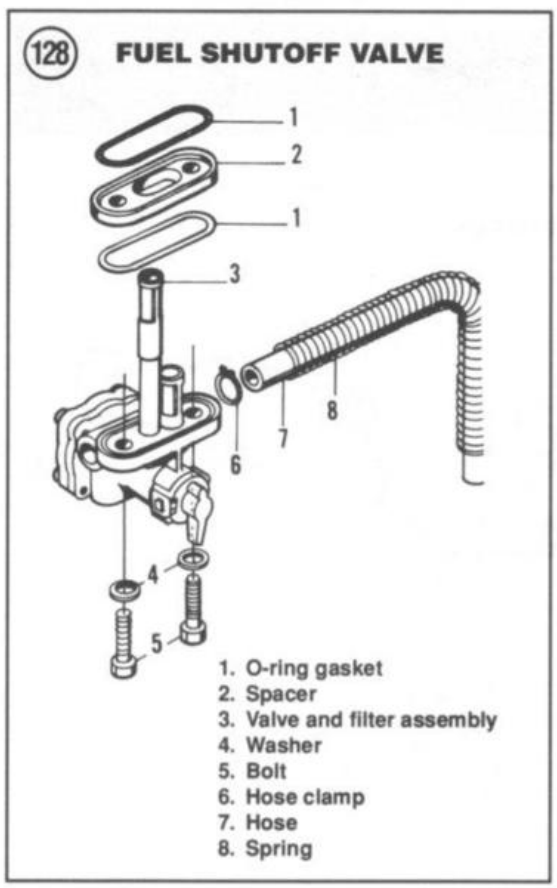


FUEL TANK

Removal/Installation

1. Place the bike on its sidestand.
2. Remove the seat as described in Chapter Thirteen.
3. Turn the fuel shutoff valve to the OFF position (A, **Figure 123**) and remove the fuel line (B, **Figure 123**) from the shutoff valve.





4. Insert a golf tee into the end of the fuel line to prevent the dribbling of fuel and avoid the entry of foreign matter.
5. Remove the bolts (**Figure 124**) securing the fuel tank at the rear.
6. On DR250 and DR350 models, remove the bolt on each side securing the front of the fuel tank to the frame.
7. On California models, perform the following:
   a. Lift up on the rear of the tank and set it on a spacer.
   b. Disconnect the fuel tank roll-over valve vent line (**Figure 125**) from the fitting on the fuel tank.
8. Insert a golf tee into the vent line to prevent the entry of foreign matter.
9. Pull the fuel tank (**Figure 126**) up and toward the rear and remove the fuel tank.
10. Install by reversing these removal steps while noting the following:
    a. On California models, be sure to connect the fuel tank roll-over valve vent line (**Figure 125**) onto the fitting on the fuel tank.
    b. Check the fuel hose for leaks.

NOTE

*Motorcycle fuel tanks are relatively maintenance free. However, a major cause of fuel tank leakage occurs when the fuel tank is not mounted securely and it vibrates during riding. When installing the tank, make sure that the rubber dampers on the frame at the front (**Figure 127**) and the rubber mounts at the rear of the fuel tank are in position and that the tank is mounted securely at the front and back with the proper fasteners.*

    c. Tighten the mounting bolts securely.

FUEL SHUTOFF VALVE

Removal/Installation

Refer to **Figure 128** for this procedure.

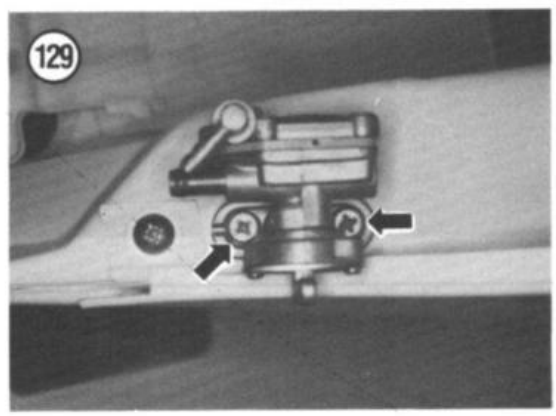
1. Remove the fuel tank as described in this chapter.
2. Drain the fuel from the tank into a safety approved sealable gasoline storage canister.
3. Lay the fuel tank on a blanket or several shop cloths to protect the paint finish.

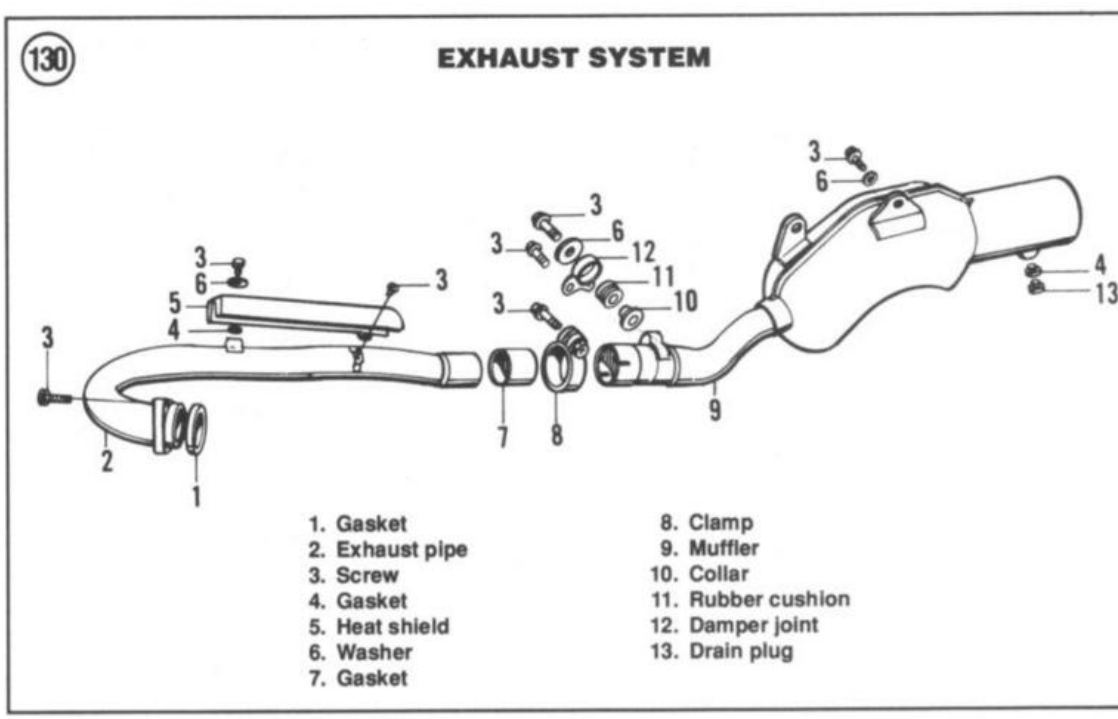
4. Remove the screws and washers (**Figure 129**) securing the fuel shutoff valve to the bottom of the fuel tank. Remove the fuel valve.
5. Remove the spacer and O-ring gaskets from the valve.
6. Clean all parts in solvent with a medium soft toothbrush, then dry.
7. Check the O-ring gaskets; replace if they are starting to deteriorate or get hard.
8. Install the O-ring gaskets and spacer between the valve and the fuel tank.
9. Install the valve on the tank and tighten the screws securely.
10. Pour a small amount of fuel into the tank and check for leaks. Do not install the fuel tank if there is even a minimal fuel leak; correct the problem first, then install the tank.

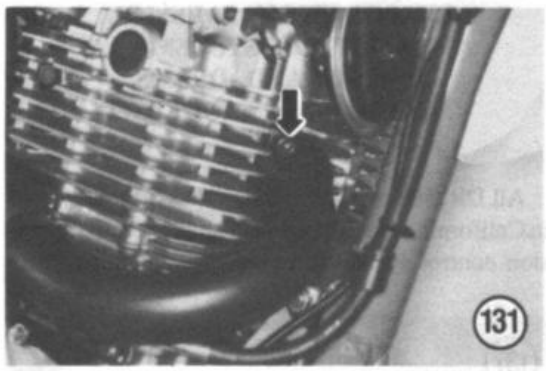
EXHAUST SYSTEM

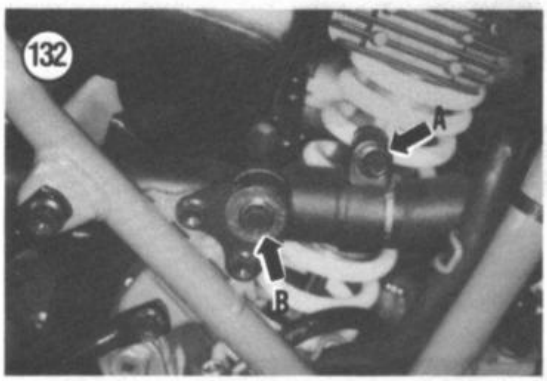
Removal/Installation

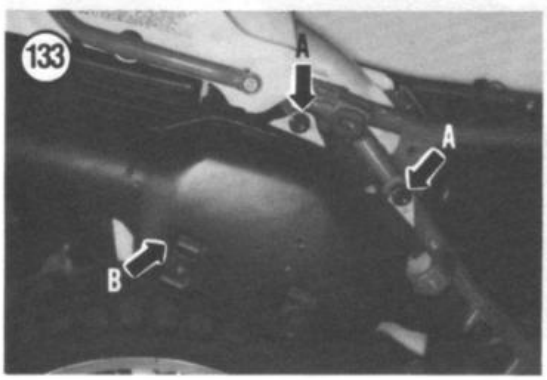
Refer to **Figure 130** for this procedure.
1. Remove the seat as described in Chapter Thirteen.
2. Remove the frame's side cover on each side.
3. Remove the fuel tank as described in this chapter.
4. Place the bike on its sidestand.
5. Loosen the exhaust pipe bolts (**Figure 131**) at the cylinder head. Only 1 bolt is visible, there are a total of 2 bolts, loosen both bolts.
6. Loosen the exhaust pipe-to-muffler clamp bolt (A, **Figure 132**).
7. Remove the bolt and washer (B, **Figure 132**) securing the muffler assembly at the front.
8. Remove the bolts and washers (A, **Figure 133**) securing the muffler assembly at the rear.
9. Pull the muffler toward the rear and out of the exhaust pipe.
10. Remove the muffler (B, **Figure 133**) from the frame.

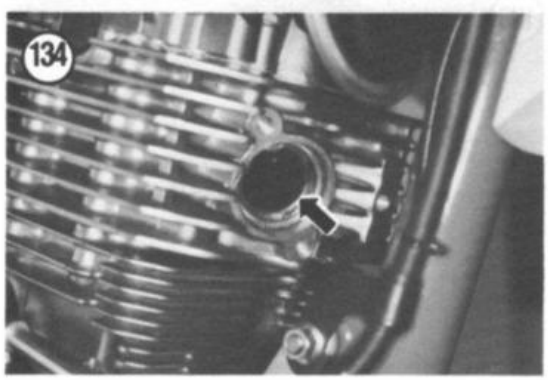












11. Remove the exhaust pipe bolts (**Figure 131**) at the cylinder head and remove the exhaust pipe assembly.

12. Install by reversing the removal steps while noting the following:

a. Install a new exhaust pipe gasket (**Figure 134**) in the cylinder head.

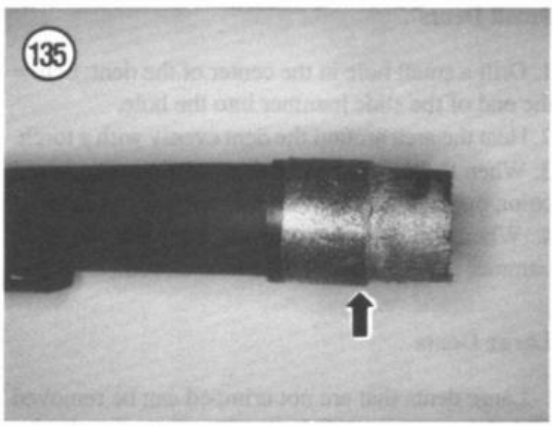
b. Make sure the new gasket (**Figure 135**) is in place at the rear of the exhaust pipe assembly.

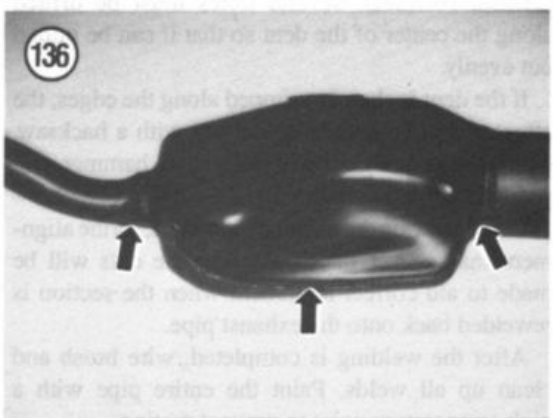
c. Install the exhaust pipe and muffler loosely until the complete exhaust system is installed.

d. Then tighten the bolts starting with the exhaust pipe bolts at the cylinder head and work toward the muffler. See **Table 2** for tightening torques.

Inspection

1. Inspect all of the welds (**Figure 136**) on the muffler joints. Check for any signs of exhaust leakage; repair or replace the muffler if damage is severe.





2. Inspect the front heat guard (**Figure 137**) for damage. If necessary, remove the screws, washers and gaskets securing the heat guard and replace it. Tighten the screws securely.
3. Inspect the damper joint (**Figure 138**) for damage or deterioration of the rubber damper. Replace any worn or damaged part(s).
4. Inspect the gasket (**Figure 135**) where the exhaust pipe enters the muffler for deterioration or damage; replace if necessary.
5. Inspect the exhaust pipe clamp (**Figure 139**) for wear or damage; replace if necessary. Apply WD-40, or equivalent, to the bolt threads prior to installation.

EXHAUST SYSTEM REPAIR

A dent in the exhaust pipe will alter the system's flow characteristics and degrade performance. Minor damage can be easily repaired if you have welding equipment, some simple body tools, and a bodyman's slide hammer.

Small Dents

1. Drill a small hole in the center of the dent. Screw the end of the slide hammer into the hole.
2. Heat the area around the dent evenly with a torch.
3. When the dent is heated to a uniform orange-red color, operate the slide hammer to raise the dent.
4. When the dent is removed, unscrew the slide hammer and weld the drilled hole closed.

Large Dents

Large dents that are not crimped can be removed with heat and a slide hammer as previously described. However, several holes must be drilled along the center of the dent so that it can be pulled out evenly.

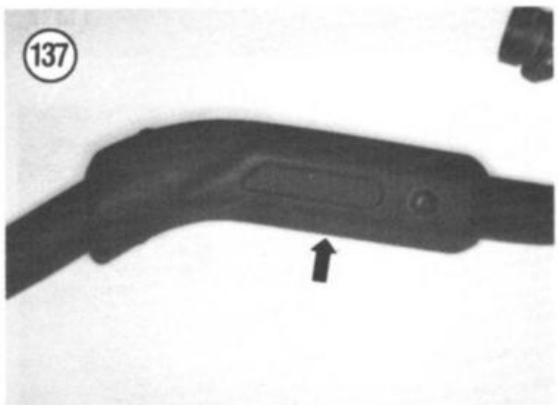
If the dent is sharply crimped along the edges, the affected section should be cut out with a hacksaw, straightened with a body dolly and hammer and welded back into place.

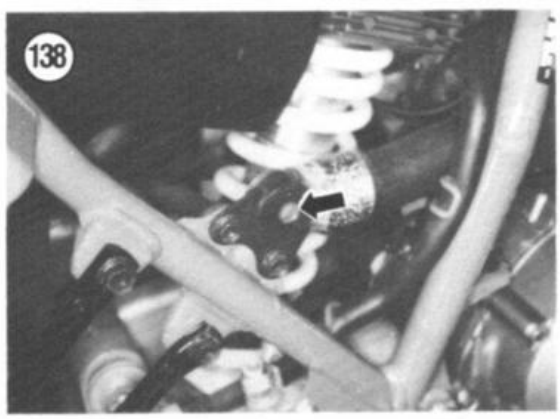
Before cutting the exhaust pipe apart, scribe alignment marks over the area where the cuts will be made to aid correct alignment when the section is rewelded back onto the exhaust pipe.

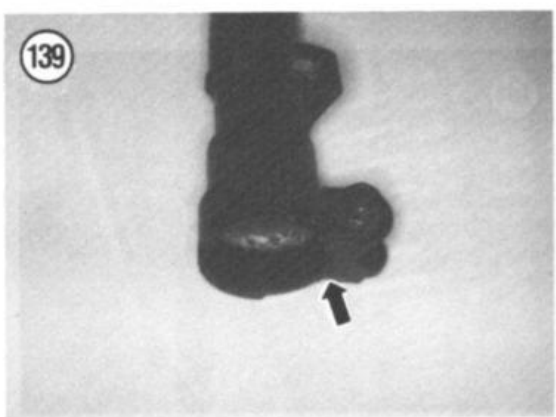
After the welding is completed, wire brush and clean up all welds. Paint the entire pipe with a high-temperature paint to prevent rusting.

EVAPORATION EMISSION CONTROL SYSTEM (DR250S AND DR350S CALIFORNIA MODELS)

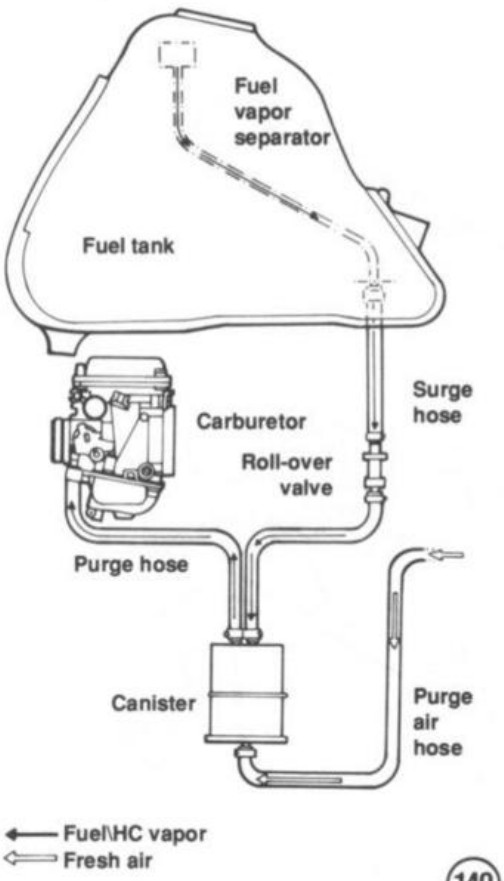
All DR250S and DR350S models originally sold in California are equipped with an evaporative emission control system to reduce the amount of fuel

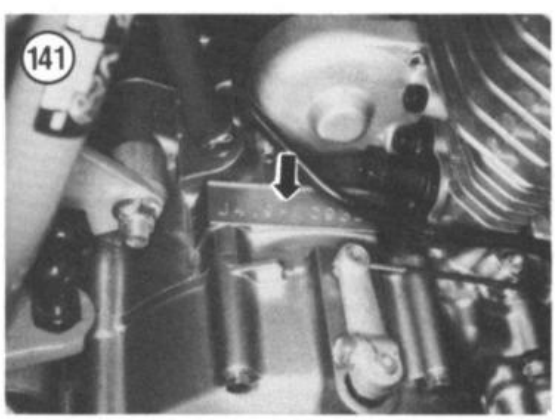






EVAPORATION EMISSION CONTROL SYSTEM (DR250S AND DR350S CALIFORNIA MODELS)





vapors released into the atmosphere. The system consists of a charcoal canister, unvented fuel filler cap, roll-over valve, assorted vacuum lines and a modified carburetor and fuel tank (**Figure 140**).

During engine operation, fuel vapors formed in the fuel tank exit the tank through a roll-over valve and enter the charcoal canister through a connecting hose. The vapors are stored in the charcoal canister until the bike is ridden at high speed, then the vapors are passed through a hose to the carburetor and mixed and burned with the incoming fresh air. During low-speed engine operation or when the bike is parked, the fuel vapors remain stored in the charcoal canister.

The roll-over valve is installed in the surge line coming from the fuel tank. Air and fuel vapor passage through the valve is controlled by an internal weight. During normal riding (or when the fuel tank is properly positioned), the weight is at the bottom of the valve. In this position, the breather passage is open to allow the fuel vapors to flow to the charcoal canister at the correct engine speed. If the bike is accidentally turned over on its side, the weight moves to block off the passage. In this position it is impossible for stored fuel vapors to flow to the charcoal canister. The roll-over valve also prevents fuel from flowing to the carburetor under these conditions, since the fuel filler cap is not vented.

Service to the emission control system is limited to replacement of damaged parts. No attempt should be made to modify or remove the emission control system.

Parts Replacement

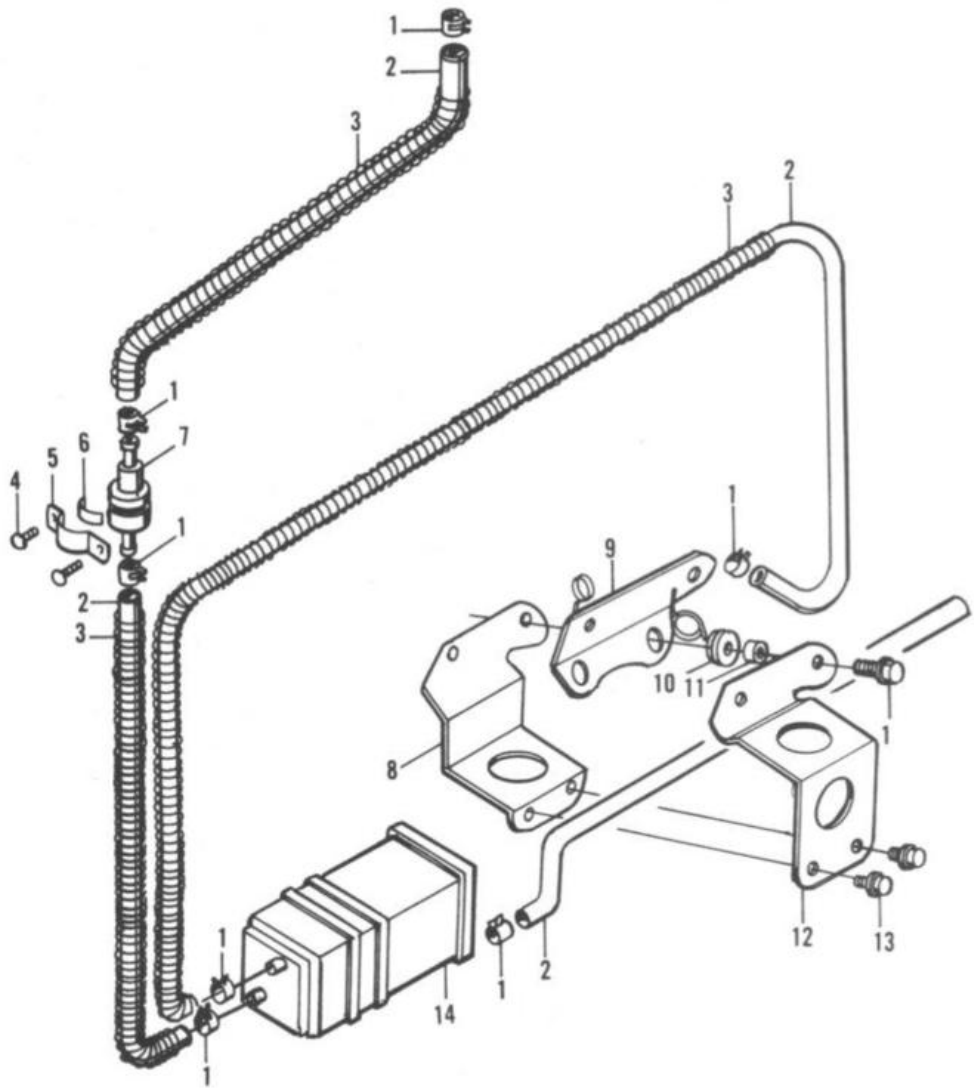
When purchasing replacement parts (e.g. carburetor, fuel tank, fuel tank cap, etc.), always make sure the parts are for California emission controlled bikes. Parts sold for non-emission controlled bikes will not work with the emission control system. Order all emission or fuel system related components with your engine serial number located on the upper right-hand crankcase (**Figure 141**) behind the cylinder.

Charcoal Canister Removal/Installation

Refer to **Figure 142** for this procedure.

1. Remove the fuel tank as described in this chapter.

CHARCOAL CANISTER (DR250S AND DR350S CALIFORNIA MODELS)



1. Hose clamp
2. Hose
3. Spring
4. Screw
5. Bracket
6. Cushion
7. Roll-over valve
8. Lower bracket
9. Inner bracket
10. Rubber cushion
11. Collar
12. Outer bracket
13. Bolt
14. Charcoal canister

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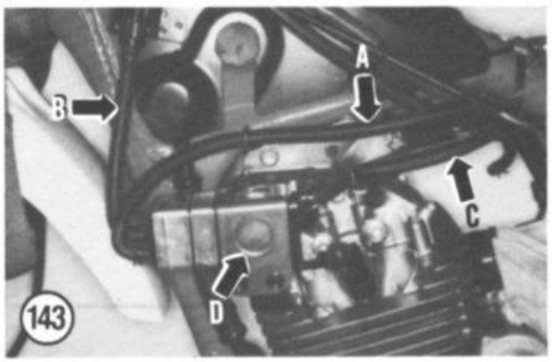
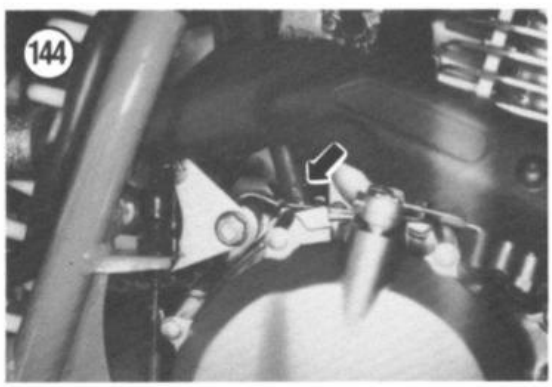
2. Disconnect the hose from the carburetor (A, **Figure 143**).

3. Disconnect the roll-over valve hose (leading from the fuel tank) (B, **Figure 143**) from the canister.





4. Insert a golf tee into the end of both hoses to prevent the entry of foreign matter.
5. Pull the vent hose (C, **Figure 143**) from the clamps on the frame.
6. Remove the bolts securing the canister (D, **Figure 143**) to the frame. Remove the charcoal canister and all 3 hoses.
7. Install by reversing these removal steps while noting the following:
   a. Refer to **Figure 142** for correct hose connections and routing.
   b. Make sure the vent hose (C, **Figure 143**) is not kinked or blocked.

CRANKCASE VENTILATION CONTROL SYSTEM

To comply with air pollution standards, all models are equipped with a crankcase ventilation control system. The system draws blowby gases from the crankcase and recirculates them into the fuel/air mixture and thus into the engine to be burned.

1. Remove the seat as described in Chapter Thirteen.
2. Remove both frame side covers.
3. Check the hose for deterioration and replace as necessary.
4. Make sure the upper and lower (**Figure 144**) hose clamps are tight, replace if necessary.
5. Remove the plug from the drain fitting and drain out all residue. Reinstall the plug and make sure it fits securely.

Tables 1-2 are on the following pages.

Table 1 CARBURETOR SPECIFICATIONS

Model	Dirt Bikes (U.S. Models) DR250	DR350
Carburetor type	Mikuni TM 31SS	Mikuni TM 33SS
I.D. mark	15DO	14D0
Main jet	130	132.5
Main air jet	0.6 mm	0.9 mm
Jet needle/clip position	6FN83-3rd	5FP96-3rd
Needle jet	P-9	P-8
Pilot jet	35	37.5
By-pass	0.8 mm	0.8 mm
Pilot outlet	0.6 mm	0.6 mm
Valve seat	1.8 mm	1.8 mm
Starter jet	40	50
Pilot screw turns out	1 5/8	1
Pilot air jet	1.3 mm	1.0 mm
Float height	13.2-15.2 mm (0.52-0.60 in.)	13.2-15.2 mm (0.52-0.60 in.)

Model	Dirt Bikes (Other than U.S. Models) DR350
Carburetor type	Mikuni TM 33SS
I.D. mark	14DO
Main jet	
1990	132.5
1991-on	127.5
Main air jet	
1990	0.9 mm
1991-on	0.7 mm
Jet needle/clip position	5FP96-3rd
Needle jet	P-8
Pilot jet	37.5
By-pass	0.8 mm
Pilot outlet	0.6 mm
Valve seat	1.8 mm
Starter jet	50
Pilot screw turns out	
1990	1 5/8
1991-on	1 1/8
Pilot air jet	1.0 mm
Float height	13.2-15.2 mm (0.52-0.60 in.)

Model	Dual Purpose Bikes (U.S. Models) DR250S	DR350S
Carburetor type	Mikuni BST 33SS	Mikuni BST 33SS
I.D. mark		
49-state models	15 D1	14D2
California models	15 D3	14D3
Main jet	132.5	135
Main air jet	0.6 mm	0.6 mm
Jet needle/clip position	5CD16/fixed	5CD16/fixed
Needle jet	O-6	O-6
Pilot jet	40	37.5
By-pass	0.8 mm	0.8 mm
Pilot outlet	0.8 mm	0.6 mm
Valve seat	1.5 mm	1.5 mm
Starter jet	40	37.5

(continued)

Table 1 CARBURETOR SPECIFICATIONS (continued)

Model	Dual Purpose Bikes (U.S. Models) DR250S	DR350S
Pilot screw turns out	pre-set	pre-set
Pilot air jet	1.4 mm	1.3 mm
Float height	13.6-15.6 mm (0.53-0.61 in.)	13.6-15.6 mm (0.53-0.61 in.)

Model	Dual Purpose Bikes (Other than U.S. Models) DR350S (U.K.)	DR350S (W. Germany)
Carburetor type	Mikuni BST 33SS	Mikuni BST 33SS
I.D. mark	14D1	14D4
Main jet	135	135
Main air jet	0.6 mm	0.6 mm
Jet needle/clip position	CD18-3rd	5CD18-3rd
Needle jet	O-6	O-6
Pilot jet	37.5	40
By-pass	0.8 mm	0.8 mm
Pilot outlet	0.8 mm	0.8 mm
Valve seat	1.5 mm	1.5 mm
Starter jet	37.5	37.5
Pilot screw turns out	pre-set/2.0 turns	pre-set/1.0 turns
Pilot air jet	0.6 mm	0.6 mm
Float height	13.6-15.6 mm (0.53-0.61 in.)	13.6-15.6 mm (0.53-0.61 in.)

Model	Dual Purpose Bikes (Other than U.S. Models) DR350S (Canada)	DR350S (Switzerland)
Carburetor type	Mikuni BST 33SS	Mikuni BST 33SS
I.D. mark	14D6	14D5
Main jet	135	135
Main air jet	0.6 mm	0.6 mm
Jet needle/clip position	5CD18-3rd	5CD18-3rd
Needle jet	O-6	O-6
Pilot jet	37.5	37.5
By-pass	0.8 mm	0.8 mm
Pilot outlet	0.8 mm	0.8 mm
Valve seat	1.5 mm	1.5 mm
Starter jet	37.5	37.5
Pilot screw turns out	pre-set/2.0 turns	pre-set/2.0 turns
Pilot air jet	0.6 mm	0.6 mm
Float height	13.6-15.6 mm (0.53-0.61 in.)	13.6-15.6 mm (0.53-0.61 in.)

Table 2 EXHAUST SYSTEM TIGHTENING TORQUES

Item	N•m	ft.-lb.
Exhaust pipe-to-cylinder head bolt	18-28	13-20
Exhaust pipe-to-muffler clamp bolt	18-28	13-20
Muffler mount bolts	18-28	13-20

8

CHAPTER NINE

ELECTRICAL SYSTEMS

This chapter contains operating principles and service procedures for all electrical and ignition components.

The electrical systems include:

a. Charging system.

b. Ignition system.

c. Lighting system.

d. Switches.

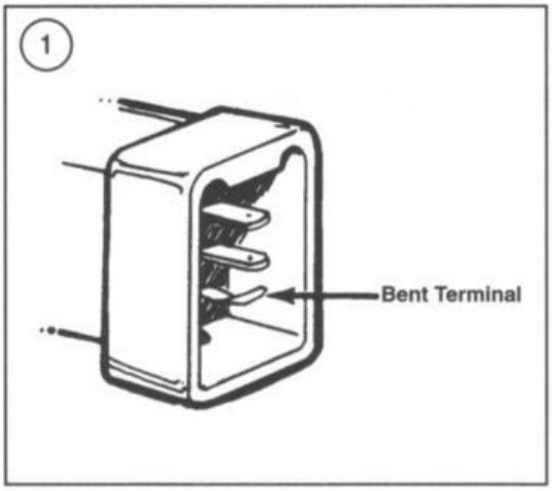
Refer to Chapter Three for routine ignition system maintenance. Electrical system specifications are found in **Tables 1-4** at the end of the chapter.

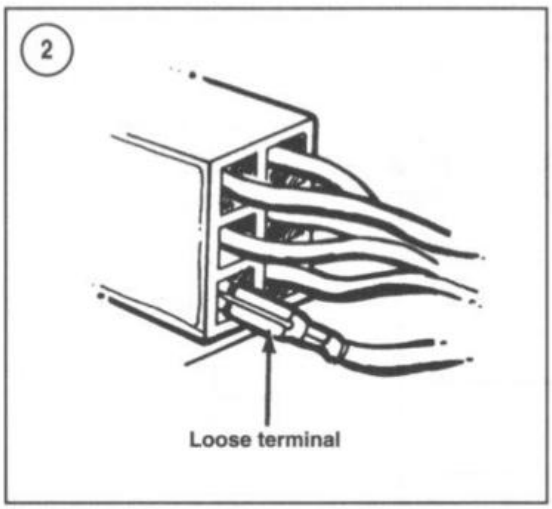
ELECTRICAL TROUBLESHOOTING

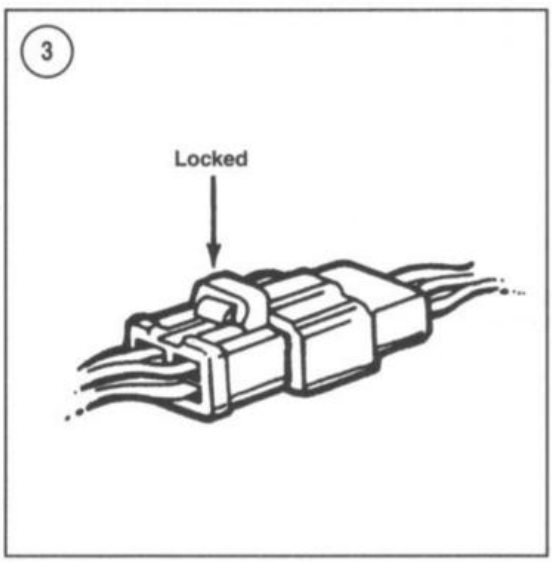
This section describes the basics of electrical troubleshooting, how to use test equipment and the basic test procedures with the various pieces of test equipment.

Electrical troubleshooting can be very time consuming and frustrating without proper knowledge and a suitable plan. Refer to the wiring diagrams at the end of the book and at the individual electrical system diagrams included with the charging system and the ignition system sections in this chapter. Wiring diagrams will help you determine how the circuit should work by tracing the current paths from the power source through the circuit components to ground.

As with all troubleshooting procedures, analyze typical symptoms in a systematic procedure. Never assume anything and don't overlook the obvious, such as an electrical connector that has separated. Test the simplest and most obvious cause first and try to make tests at easily accessible points on the bike.







Preliminary Checks and Precautions

Prior to starting any electrical troubleshooting procedure perform the following:

a. On models so equipped, inspect the battery. Make sure it is fully charged and that the battery leads are clean and securely attached to the battery terminals. Refer to *Battery* in Chapter Three.

b. Disconnect each electrical connector in the suspect circuit and check that there are no bent terminals inside the electrical connector (**Figure 1**). A bent terminal will not connect to its mate in the other connector, causing an open circuit.

c. Make sure the terminals are pushed all the way into the plastic connector (**Figure 2**). If not, carefully push them in with a narrow blade screwdriver.

d. Check the wires where they connect to individual terminals for damage.

e. Make sure all terminals within the connector are clean and free of corrosion. Clean, if necessary, and pack the connectors with a dielectric grease compound.

f. After all is checked out, push the connectors together and make sure they are fully engaged and locked together (**Figure 3**).

g. Never pull on the electrical wires when disconnecting an electrical connector–pull only on the connector plastic housing.

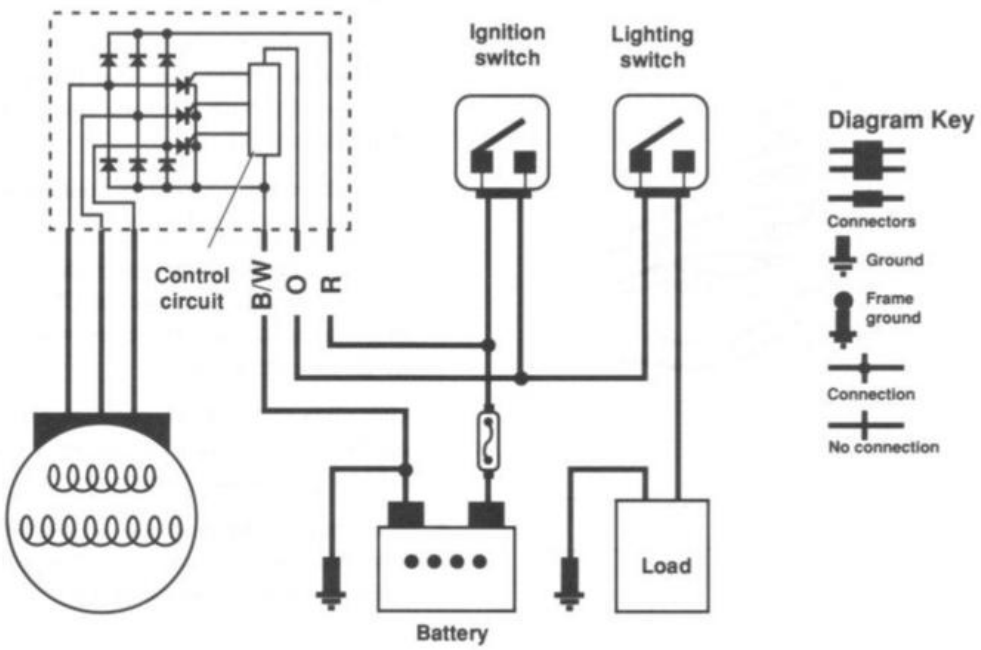
CHARGING SYSTEM (DR250S and DR350S)

The charging system consists of the battery, alternator and a solid state rectifier/voltage regulator as shown in **Figure 4**.

The alternator generates an alternating current (AC) which the rectifier converts to direct current (DC). The regulator maintains the voltage to the battery and load (lights, ignition, ect.) at a constant level regardless of variations in engine speed and load. Refer to Chapter Three for battery service.

4

CHARGING SYSTEM DR250S/DR350S (U.S. AND U.K.)

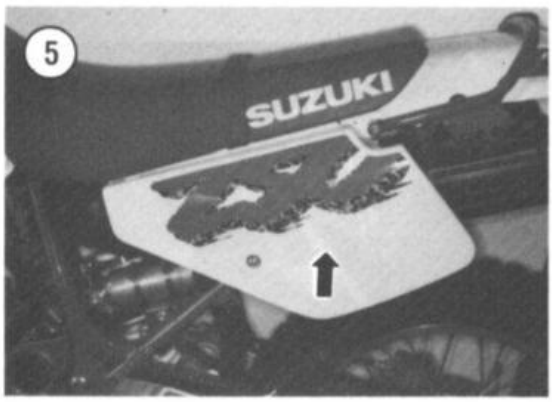


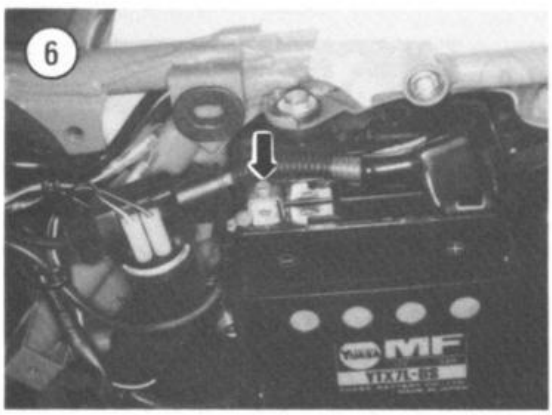
Color Code
R = Red
O = Orange
B/W = Black/white

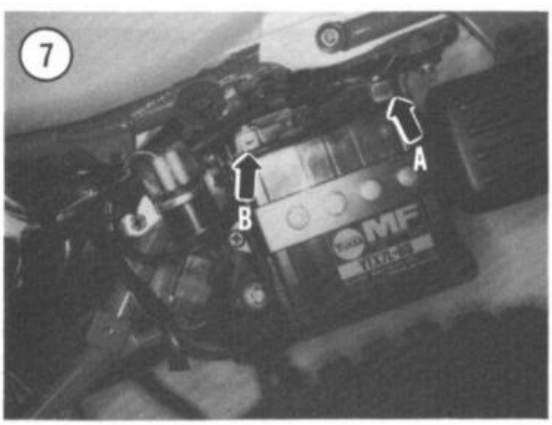
Leakage Test

Perform this test prior to performing the output test.

1. Remove the seat as described in Chapter Thirteen.
2. Remove the frame left-hand side cover (**Figure 5**).
3. Turn the ignition switch OFF.
4. Disconnect the battery negative lead (**Figure 6**).
5. Connect an ammeter between the battery negative lead and the negative terminal of the battery.







6. The ammeter should read less than 0.1 mA. If the amperage is greater this indicates there is a voltage drain in the system that will drain the battery.

Charging System Output Test

Whenever the charging system is suspected of trouble, make sure the battery is fully charged before going any further. Clean and test the battery as described in Chapter Three. If the battery is in good condition, test the charging system as follows.

1. Remove the left-hand side cover (**Figure 5**).
2. Turn the light switch to the HI position.
3. Do *not* disconnect either battery leads for this test. They must remain connected to the battery.
4. Start the engine and allow it to warm up. Increase engine speed to 5,000 rpm. The ammeter should read 10 amps or less for the charging system to be operating correctly. If the amperage is not within specifications, check the charging coil resistance as described under *Charge Coil Testing* in this chapter.
5. Connect a DC voltmeter between the battery positive (+) terminal (A, **Figure 7**) and the battery negative (–) terminal (B, **Figure 7**) and note the reading. If the value is not within the specified range listed in **Table 1**, inspect the alternator no load performance and the regulator/rectifier as described in this chapter.

Alternator No-Load Performance Test

It is not necessary to remove the stator assembly to perform the following tests. It is shown removed in the following procedures for clarity.

In order to get accurate resistance measurements the stator assembly and coil must be warm (approximately 68° F [20° C]).

1. Remove the seat as described in Chapter Thirteen.
2. Remove the fuel tank as described in Chapter Eight.
3. Follow the electrical wire harness from the alternator, up the left-hand frame down tube and to the area adjacent to the air filter air box. Disconnect the alternator 3-pin electrical connector containing 3 yellow wires.
4. Start the engine and allow it to warm up. Increase engine speed to 5,000 rpm and maintain this speed.
5. Connect an AC voltmeter between each of the 3 yellow wire electrical connector terminals. Test the electrical connector on the stator coil side.

6. If the value is not within the specified range listed in **Table 1**, check the electrical wires and the connector. If they are okay, replace the alternator stator assembly as in this chapter.
7. Make sure the electrical connectors are free of corrosion and are completely coupled to each other.
8. Install all items removed.

Alternator Stator Coil Test

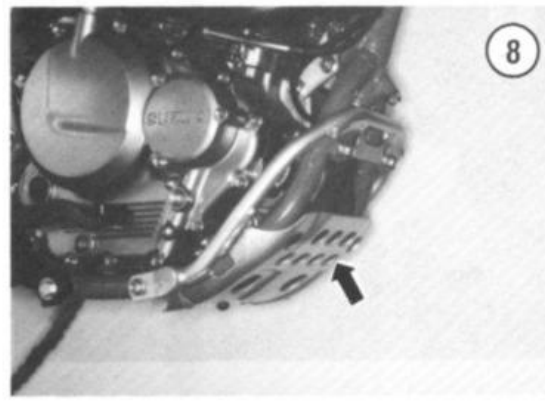
It is not necessary to remove the stator plate to perform the following tests. In order to get accurate resistance measurements, the stator assembly and coil must be warm (minimum temperature is 20° C [68° F]). If necessary, start the engine and let it warm up to normal operating temperature.
1. Remove the seat as described in Chapter Thirteen.
2. Follow the electrical wire harness from the alternator, up the left-hand frame down tube and to the area adjacent to the air filter air box. Disconnect the alternator 3-pin electrical connector containing 3 yellow wires.
3. Use an ohmmeter set at R × 10 and check resistance between each yellow wire on the alternator side of the connector.
4. The specified resistance is 0.1-1.3 ohms. If there is continuity (indicated resistance) and it is within the specified resistance, the coil is good. If there is no continuity (infinite resistance) or the resistance is less than specified, the coil is bad and the stator assembly must be replaced (the individual coil cannot be replaced).
5. Use an ohmmeter set at R × 10 and check resistance between each yellow wire and ground. If there is continuity (indicated resistance) between any yellow wire and ground, the coil is shorted and the stator assembly must be replaced (the individual coil cannot be replaced).
6. Make sure the electrical connectors are free of corrosion and are completely coupled to each other.
7. Install all items removed.

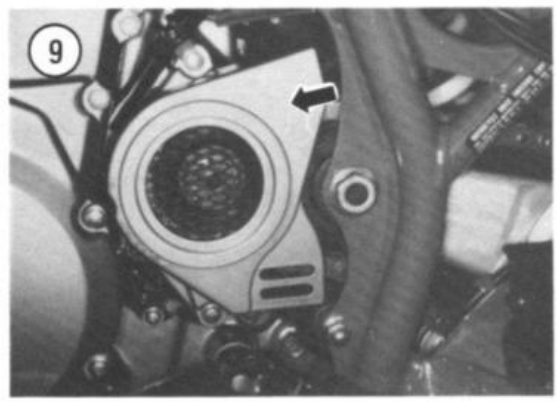
CHARGING SYSTEM (DR250 AND DR350)

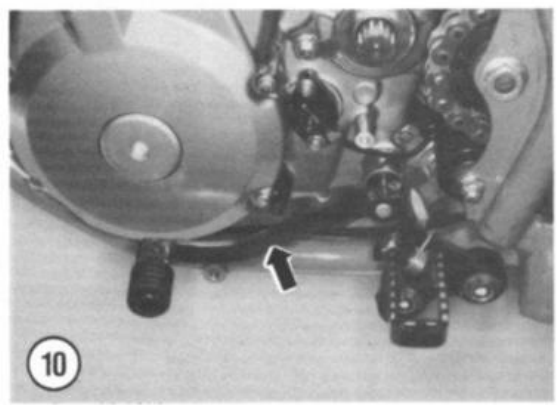
The charging system on the DR250 and DR350 models is used for the lighting system. The charging system performance test is described in the lighting system section of this chapter. Refer to *Lighting System (DR250 and DR350)* for testing information.

ALTERNATOR

The alternator is a form of electrical generator in which a magnetized field called a rotor revolves around a set of stationary coils called a stator. As the rotor revolves, alternating current is induced in the stator. The current is then rectified to direct current and used to operate the electrical accessories on the motorcycle and to charge the battery (models so equipped). The rotor is a permanent magnet.





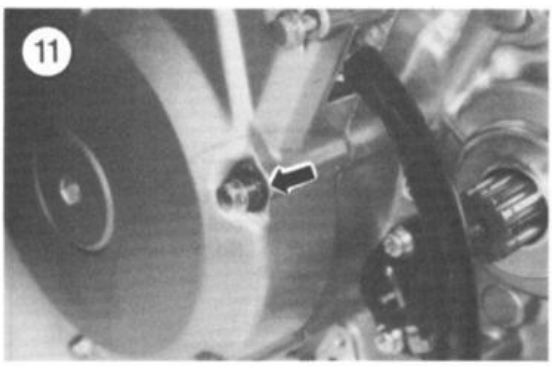


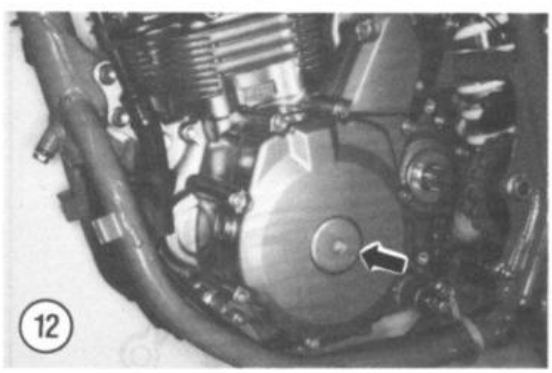
Stator Assembly
Removal/Installation

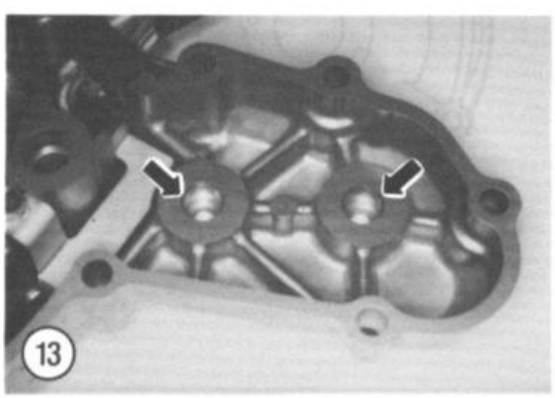
NOTE

This procedure is shown on an electric start model. The left-hand crankcase cover is larger, on this model, in order to support the starter reduction gear shafts in the crankcase directly behind it.

1. Remove the seat as described in Chapter Thirteen.
2. Remove the fuel tank as described in Chapter Eight.







3. Remove the frame's left-hand side cover (**Figure 5**).
4. Disconnect the battery negative (–) electrical terminal connector (**Figure 6**).
5. Drain the engine oil as described in Chapter Three.
6. Remove the bolts securing the engine skid plate (**Figure 8**) and remove the skid plate.
7. Remove the screws securing the drive sprocket cover (**Figure 9**) and remove the cover.
8. Remove the pinch bolt securing the shift lever (**Figure 10**) and pull the shift lever off the shaft. If the splined boss is tight on the shaft, spread the slot, in the lever, open with a screwdriver.

NOTE

The number of electrical wires and connectors attached to the alternator stator assembly varies among the different models and years.

9. Follow the electrical wire harness from the alternator, up the left-hand frame down tube and to the area adjacent to the air filter air box. Disconnect all alternator stator electrical connectors.
10. Remove the tie wrap(s) securing the alternator electrical harness to the frame down tube. Carefully pull the electrical wire harness free from the frame.

NOTE

*The number and location of bolts that are equipped with a special washer varies among the different models and years. Note the location of these special washers (**Figure 11**) during removal and make sure they are installed in the correct location during installation. If the special washers are not installed in the correct location there will be an oil leak.*

11. Remove the screws securing the left-hand crankcase cover (**Figure 12**), then remove the cover and gasket. Don't lose the locating dowel(s).

NOTE

The following steps are shown with the engine removed from the frame for clarity.

12. Inspect the left-hand crankcase cover for cracks or damage. Replace if necessary.
13. On electric start models, inspect the starter reduction gear shaft bearing surfaces (**Figure 13**). If they appear worn, remove the starter reduction gears

(as described in this chapter) and install the gear shafts into their respective receptacles and check for wear. Suzuki does not provide any service specifications for these parts. The shaft should be a snug fit in the cover, but if the shaft feels too loose or there has been an abnormal noise during the start-up sequence, the shaft may have been spinning in the cover; replace the left-hand crankcase cover if necessary.

14. Remove the screws securing the stator assembly (A, **Figure 14**).

15A. On single pickup coil models, remove the screws securing the pickup coil assembly.

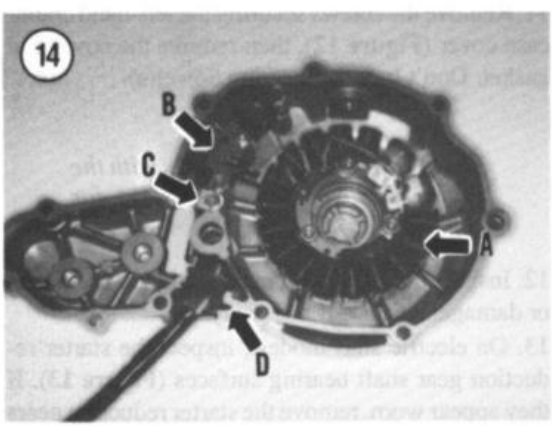
15B. On dual pickup coil models, remove the bolts, nuts and spacer securing both pickup coil assemblies (B, **Figure 14**). Don't lose the spacer between the 2 pickup coil assemblies.

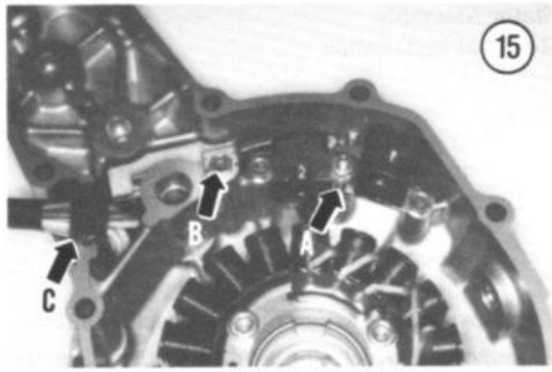
16. Remove the wire harness clamp and bolt (C, **Figure 14**).

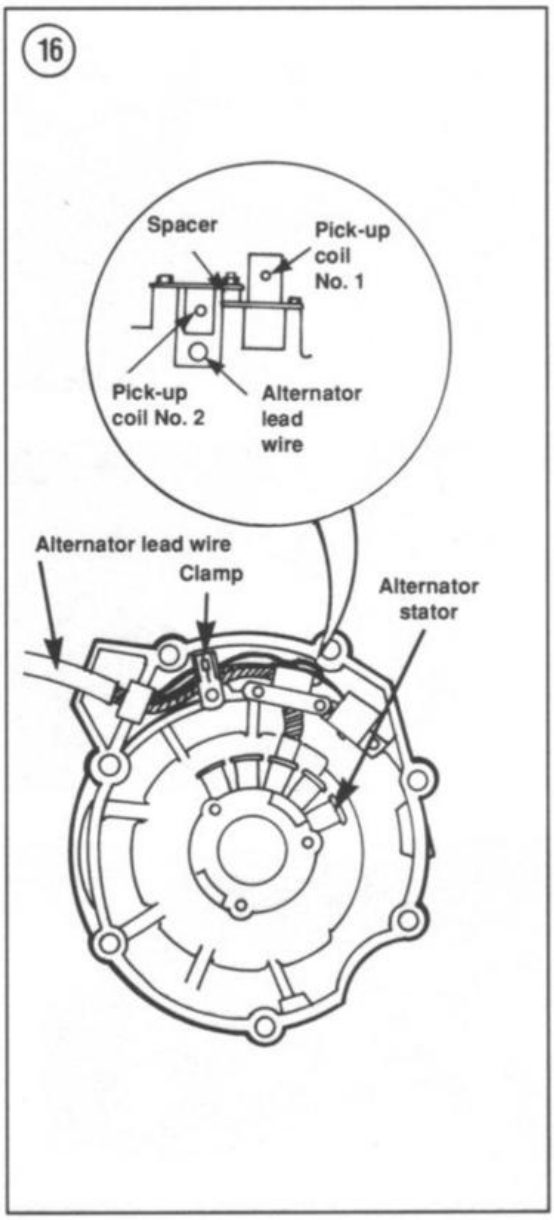
17. Carefully pull the electrical harness out along with the rubber grommet (D, **Figure 14**) from the left-hand crankcase cover.

18. Install by reversing these removal steps while noting the following:

a. On dual pickup models, be sure to install the spacer (A, **Figure 15**) between the 2 pickup coil assemblies. Refer to **Figure 16**.
b. Be sure to install the wire harness clamp and bolt (B, **Figure 15**).
c. Tighten the bolts and nut securely.
d. Make sure the rubber grommet (C, **Figure 15**) is pushed all the way down in the cover to form a good water tight seal.
e. Make sure the locating dowel(s) (**Figure 17**) is in place.







f. Apply a *light* coat of silicone sealer to the backside of the gasket to hold it in place. Install a new gasket (**Figure 18**) and cover.

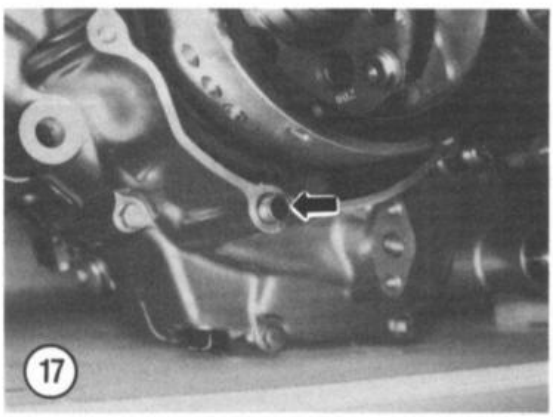
g. Be sure to install the special washer(s) (**Figure 11**) and bolt(s) in the correct location.

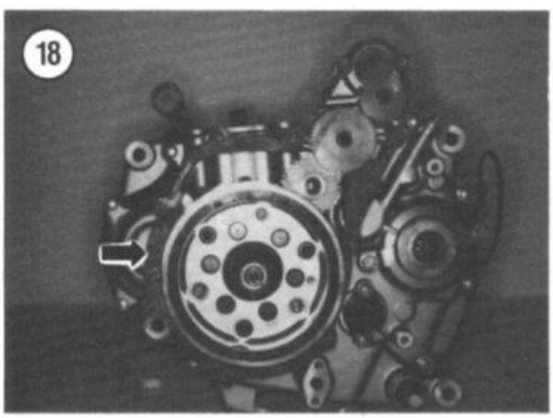
h. Place all bolts into the cover holes and up against the crankcase, don't thread them in at this time. Make sure they all stick out the same distance from the cover surface (**Figure 19**). If some are farther in or out than the rest they are in the wrong location. Reposition at this time. Tighten all bolts securely.

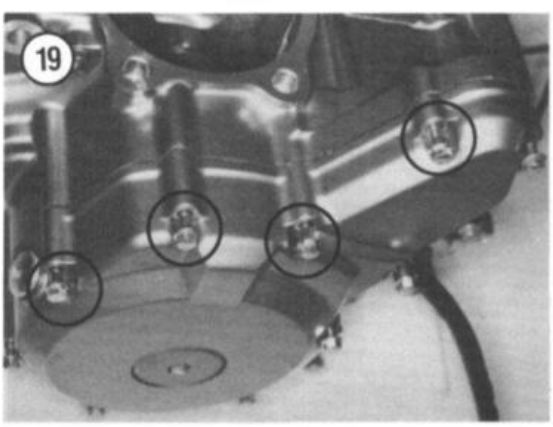
i. Make sure all electrical connectors are free of corrosion and are tight.

j. Route the electrical harness through the original location in the frame.

k. Refill the engine with the correct amount of oil; refer to Chapter Three.







Rotor Removal

1. Perform Steps 1-11 of *Alternator Stator Removal/Installation* in this chapter.

2. On electric start models, remove the starter reduction gears as described in Chapter Five.

3. Shift the transmission into 6th gear and have an assistant apply the rear brake. This will prevent the rotor from turning in the next step.

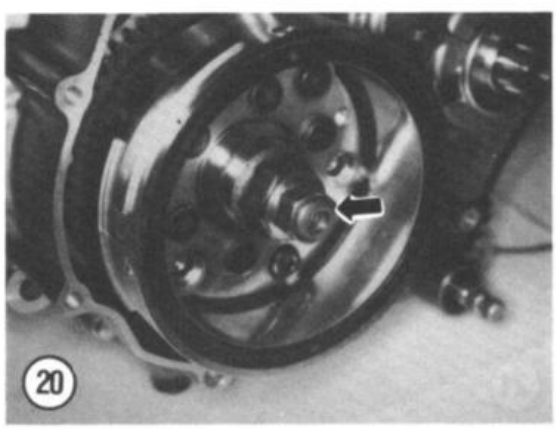
4. Loosen the magneto rotor 27 mm nut (**Figure 20**).

5. Remove the nut.

CAUTION

Don't try to remove the rotor without a puller; any attempt to do so will ultimately lead to some form of damage to the engine and/or rotor. Aftermarket pullers are available from most motorcycle dealers or mail order houses. If you can't buy or borrow one, have a dealer or service shop remove the rotor for you.

6. Screw the Suzuki flywheel puller (part No. 09930-934912) (**Figure 21**), or a universal acces-



sory puller onto the threaded portion of the rotor center.

7. Hold onto the puller with one wrench and gradually tighten the center bolt (**Figure 22**) until the rotor disengages from the crankshaft.

NOTE

If the rotor is difficult to remove, strike the puller's center bolt with a hammer a few times. This will usually break the rotor loose from the crankshaft taper.

CAUTION

If normal rotor removal attempts fail, do not force the puller as the threads may be stripped out of the rotor causing expensive rotor damage or may damage the end of the crankshaft. Take it to a dealer or service shop and have them remove it.

8A. On electric start models, perform the following:

a. Reach all the way behind the rotor and pull the starter clutch gear (**Figure 23**) and rotor as an assembly off the crankshaft.

NOTE

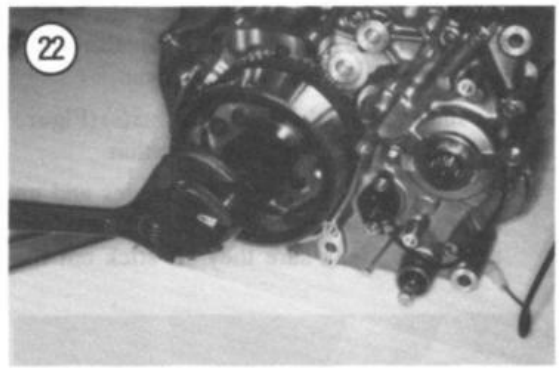
*The thrust washer (**Figure 24**) may stick to the backside of the rotor assembly during removal, if so, remove it from the rotor.*

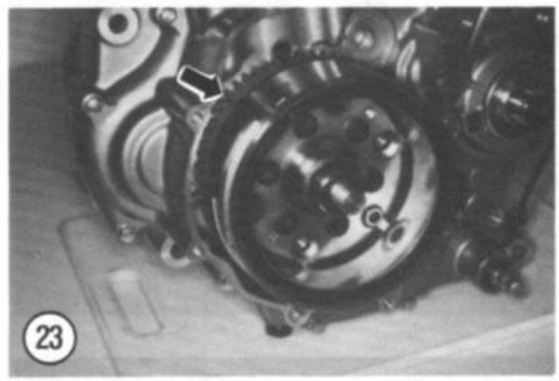
b. Remove the thrust washer (**Figure 25**) from the crankshaft.

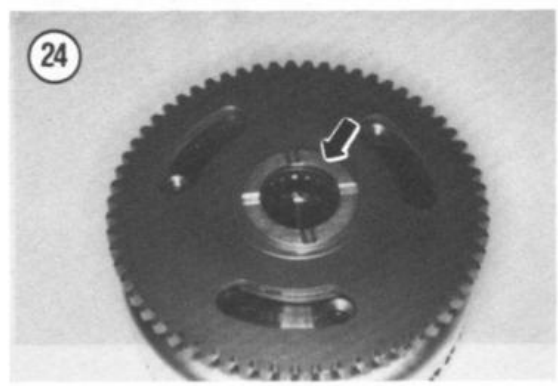
8B. On all other models, remove the rotor.

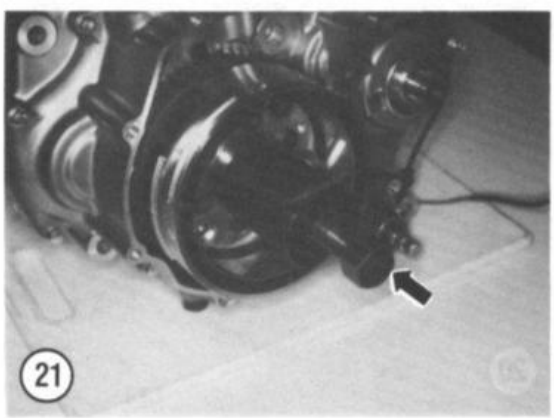
9. Unscrew the puller from the rotor.

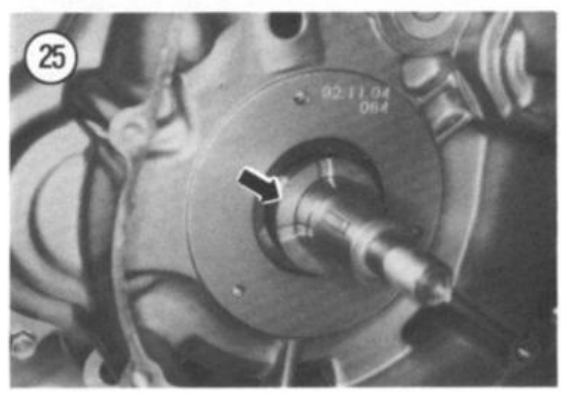
10. If necessary, remove the Woodruff key (**Figure 26**) from the crankshaft.

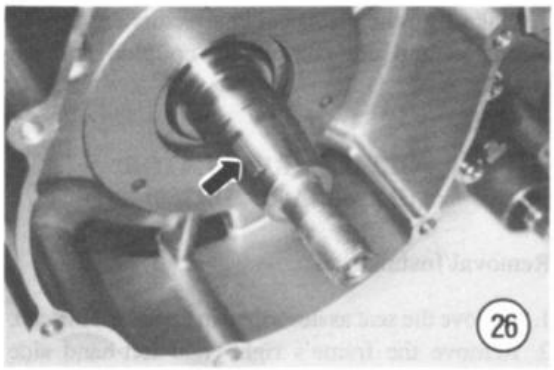




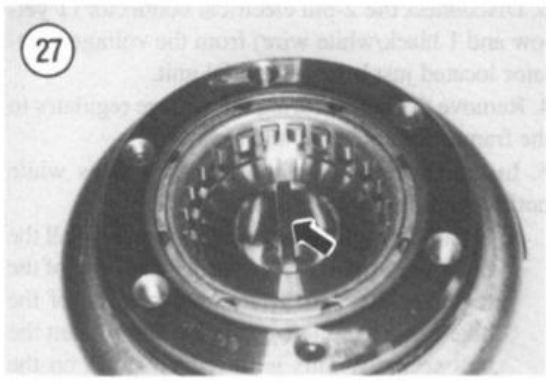


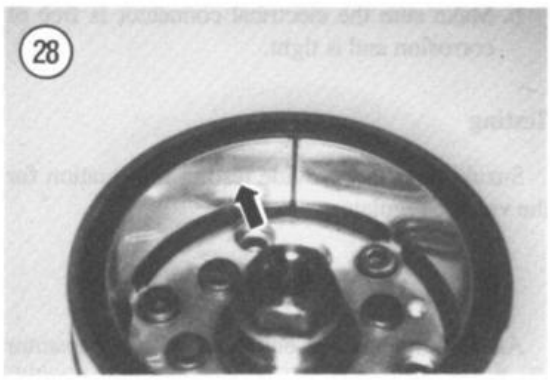






11. Check the Woodruff key and the key way (**Figure 27**) in the rotor for damage.
12. Inspect the inside of the rotor (**Figure 28**) for small bolts, washers or other metal "trash" that may have been picked up by the magnets. These small metal bits can cause severe damage to the magneto stator plate components.
13. Check the ignition pickup tabs for damage.
14. Install by reversing these removal steps while noting the following:
    a. Make sure the Woodruff key (**Figure 26**) is in place on the crankshaft. Align the key way in the rotor with the Woodruff key when installing the rotor.
    b. On electric start models, be sure to install the thrust washer (**Figure 25**) on the crankshaft prior to installing the rotor assembly.
    c. Apply red Loctite (No. 271) to the rotor nut threads prior to installation.
    d. Install the rotor nut and tighten to the torque specification in **Table 2**.

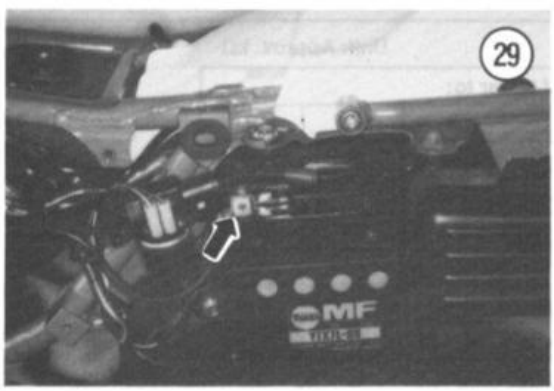


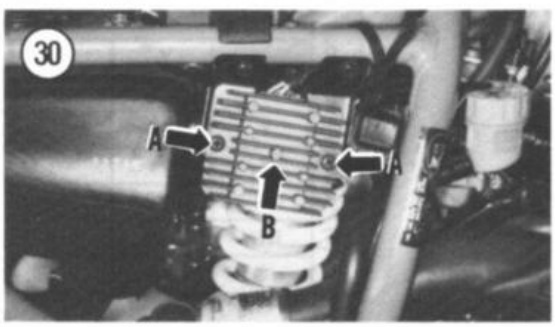


VOLTAGE REGULATOR/RECTIFIER (DR250S AND DR350S)

Removal/Installation

1. Remove the seat as described in Chapter Thirteen.
2. Remove the frame's right- and left-hand side covers.
3. Disconnect the battery negative (–) electrical terminal connector (**Figure 29**).
4. Disconnect the following voltage regulator/rectifier electrical connectors:
    a. Three pin connector: 3 yellow wires.
    b. Three pin connector: 1 orange, 1 red, 1 black/white.
5. Remove the screws (A, **Figure 30**) securing the voltage regulator/rectifier (B, **Figure 30**) to the





mounting bracket and remove the voltage regulator/rectifier.
6. Install by reversing these removal steps while noting the following:
   a. Make sure all electrical connectors are free of corrosion and are tight.
   b. Tighten the mounting screws securely.

Testing

If the regulated voltage is out of specification, measure the voltage between the following terminals.
1. Remove the seat as described in Chapter Thirteen.
2. Remove the frame's right- and left-hand side covers.
3. Disconnect the battery negative (–) electrical terminal connector (**Figure 29**).
4. Disconnect the following voltage regulator/rectifier electrical connectors:
   a. Three pin connector: 3 yellow wires.
   b. Three pin connector: 1 orange, 1 red, 1 black/white.

CAUTION

Tests may be performed on the voltage regulator unit but a good one may be damaged by someone unfamiliar with the test equipment. If you feel unqualified to perform the test, have the test made by a Suzuki dealer or have them substitute a known good unit for a suspected one.

5. Refer to **Figure 31** for ohmmeter positive (+) and negative (–) test lead placement, wire color and specified resistance values.
6. If the voltage regulator fails any of these tests the unit is faulty and must be replaced.
7. Make sure the electrical connectors are free of corrosion and are completely coupled to each other.

VOLTAGE REGULATOR (DR250 AND DR350)

Removal/Installation

1. Remove the seat as described in Chapter Thirteen.
2. Remove the frame's right- and left-hand side covers.
3. Disconnect the 2-pin electrical connector (1 yellow and 1 black/white wire) from the voltage regulator located just behind the CDI unit.
4. Remove the bolt securing the voltage regulator to the frame cross member and remove it.
5. Install by reversing these removal steps while noting the following:
   a. Install the regulator to the frame and install the bolt finger-tight. Pivot the connector end of the regulator 30° over from the centerline of the bike toward the left-hand side and tighten the bolt securely. This is to reduce strain on the regulator's electrical wires.
   b. Make sure the electrical connector is free of corrosion and is tight.

Testing

Suzuki does not provide testing information for the voltage regulator.

IGNITION SYSTEM

All DR models are equipped with a capacitor discharge ignition (CDI) system which is a solid-

31

Unit: Approx. kΩ

(–) Probe of tester to: \ (+) Probe of tester to:		Y_1	Y_2	Y_3	R	B\W	O
Y_1			∞	∞	1–5	∞	∞
Y_2		∞		∞	1–5	∞	∞
Y_3		∞	∞		1–5	∞	∞
R		∞	∞	∞		∞	∞
B\W		1–5	1–5	1–5	4–10		2–8
O		20–60	20–60	20–60	40–100	15–50	

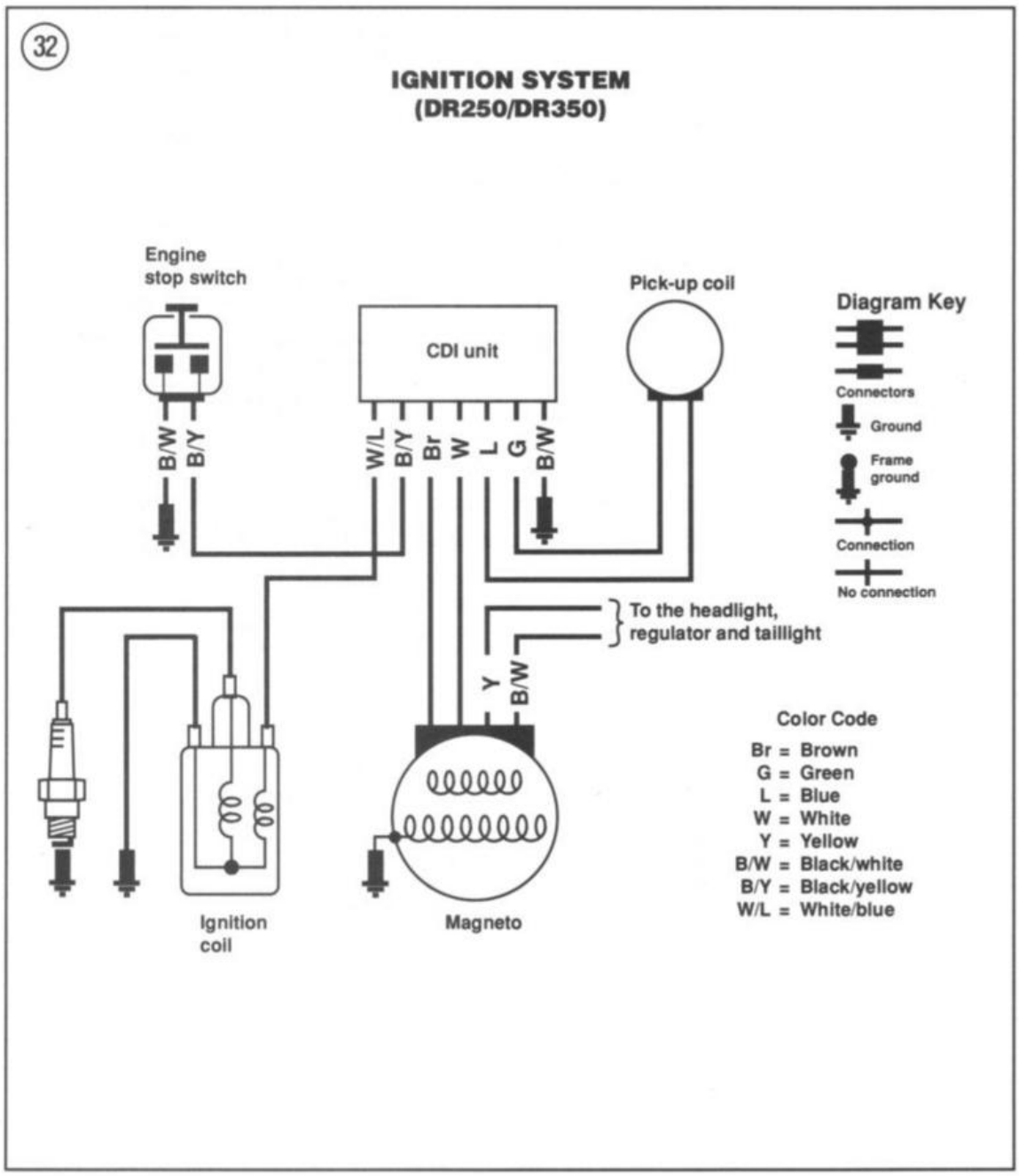
state system that uses no breaker points. The test procedures in this section apply to all models covered in this manual.

As the piston approaches the firing position, a pulse from the pickup coil is used to trigger the silicone controlled rectifier. The rectifier in turn allows the capacitor to discharge quickly into the primary circuit of the ignition coil, where the voltage is stepped up in the secondary circuit to a value sufficient to fire the spark plug.

Refer to the following ignition system schematics for these procedures:

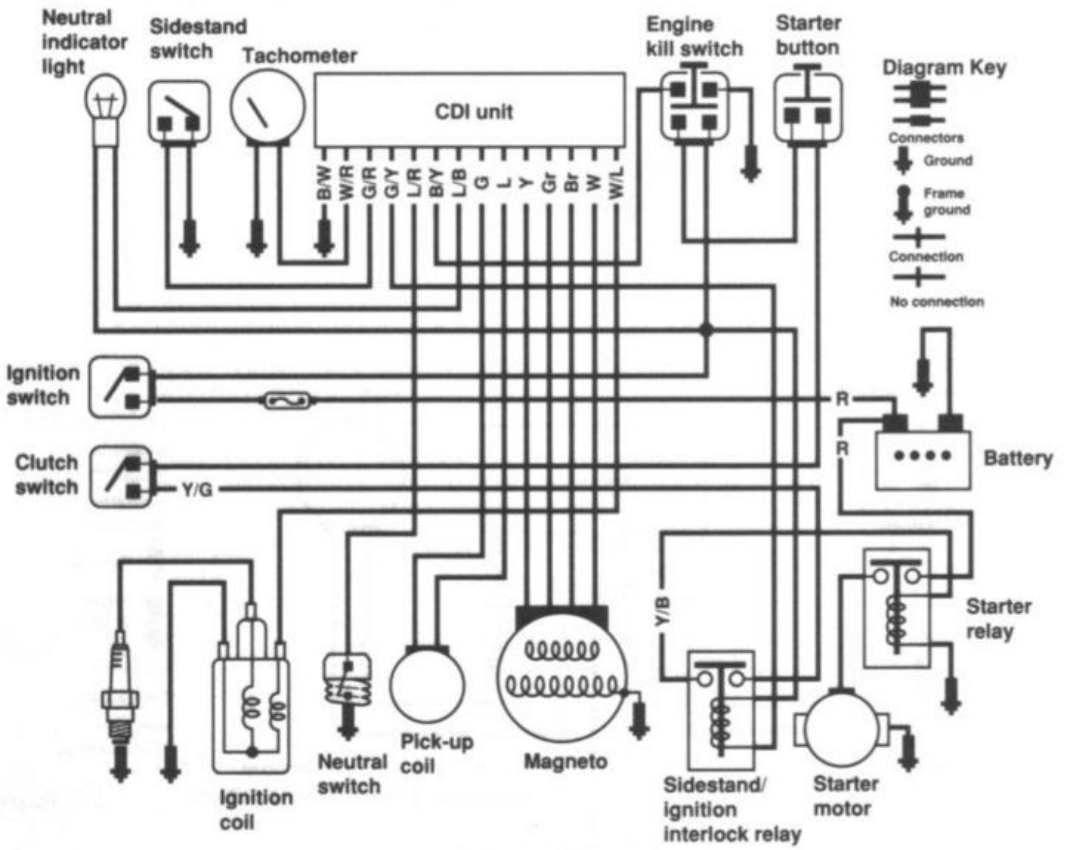
a. **Figure 32**: DR250 and DR350 models.

b. **Figure 33**: 1993-on DR250S and 1994 DR350S electric start models.



(33)

IGNITION AND STARTING SYSTEM (1993-ON DR250S AND 1994 DR350S)



Color code

Br =	Brown	G/R =	Green/red
G =	Green	G/Y =	Green/yellow
Gr =	Gray	L/B =	Blue/black
L =	Blue	L/R =	Blue/red
R =	Red	W/L =	White/blue
W =	White	W/R =	White/red
Y =	Yellow	Y/B =	Yellow/black
B/W =	Black/white	Y/G =	Yellow/green
B/Y =	Black/yellow		

c. **Figure 34**: For all other DR250S and DR350S models.

Electric Start Models

An Ignition Control System is installed on all electric start models to prevent starting the bike while the transmission is in gear or with the sidestand down.

The system consists of a neutral switch, a clutch switch and a sidestand switch. When the ignition switch and the engine stop switch are in the ON position, the ignition will produce a spark for starting *only* if the following conditions exist:

a. When the sidestand is in the up position placing the sidestand switch to the ON position.

b. When the clutch lever is pulled in, when the transmission is in any gear.

c. When the transmission is in neutral placing the neutral switch in the ON position.

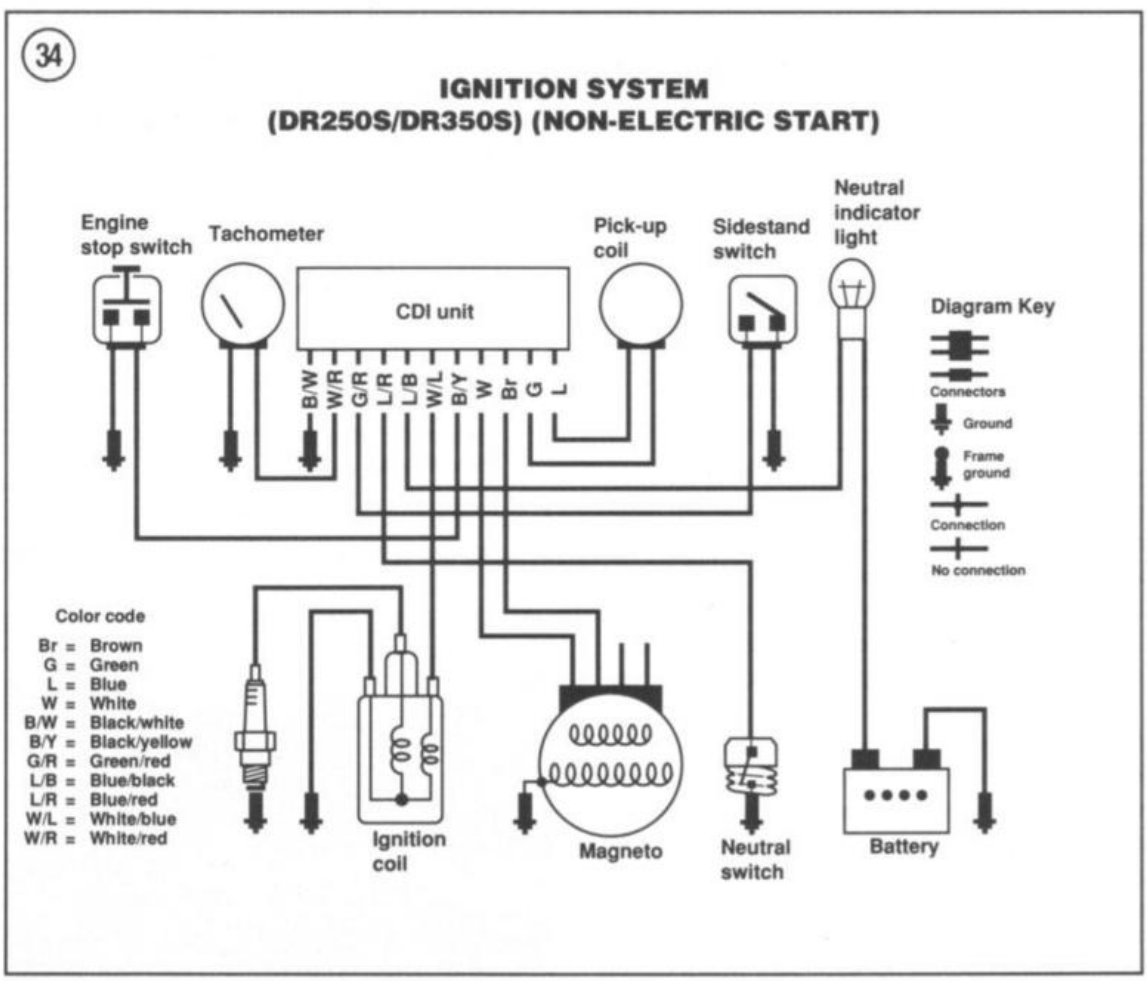
Precautions

Certain measures must be taken to protect the capacitor discharge system. Damage to the semiconductors in the system may occur if the following is not observed.

1. *Never* connect the battery (models so equipped) backwards. If the battery polarity is wrong, damage will occur to the voltage regulator, alternator and CDI unit.

2. Do *not* disconnect the battery (models so equipped) while the engine is running. A voltage surge will occur which will damage the voltage regulator and possibly burn out the lights.

3. Keep all connections between the various units clean, free of corrosion and tight. Be sure that the



wiring connectors are pushed together firmly to make a good electrical connection.

4. Each solid state unit is mounted on a rubber vibration isolator. Always be sure that the isolators are in place when reinstalling all units.

Pickup Coil and Source Coil

The pickup and the source coil cannot be replaced separately since both are an integral part of the stator assembly. If either coil is defective, replace the alternator stator assembly as described in this chapter.

Pickup Coil Testing

It is not necessary to remove the stator assembly to perform the following tests. To get accurate resistance measurements the stator assembly and coil must be warm (approximately 68° F [20° C]). If you are unable to start the bike to warm up the alternator, use a portable hair dryer and heat the stator assembly.

1. Remove the seat as described in Chapter Thirteen.
2. Remove the fuel tank as described in Chapter Eight.
3. Remove the frame's left-hand side cover.
4. Disconnect the battery negative (–) electrical terminal connector (**Figure 29**).

NOTE

The number of electrical wires and connectors attached to the alternator stator assembly varies among the different models and years.

5. Follow the electrical wire harness from the alternator, up the left-hand frame down tube and to the area adjacent to the air filter air box. Disconnect the alternator stator pickup coil(s) electrical connector(s) containing the following wire colors:
   a. Single pickup coil models: Green and blue.
   b. Dual pickup coil models: Green and blue, yellow and green.

6A. On single pickup coil models, connect an ohmmeter set at R × 100 and check resistance between the green and blue wire connector terminals. Test the connector on the pickup coil side.

6B. On dual pickup coil models, connect an ohmmeter set at R × 100 and check resistance between the No. 1 pickup coil green and blue wire connector terminals and between the No. 2 pickup coil yellow and green wire connector terminals. Test the connectors on the pickup coil side.

7. If there is continuity (specified resistance listed in **Table 2**), the coil is good. If there is no continuity or the resistance is much less or more than specified, check the electrical wires to and within the connector. If they are okay, replace the alternator stator assembly as described in this chapter. The pickup coil cannot be replaced separately since the pickup coil is an integral part of the stator assembly.
8. Reconnect the electrical connector(s) and connect the battery negative connector.
9. Install the frame's left-hand side cover, fuel tank and the seat.

Source Coil Testing

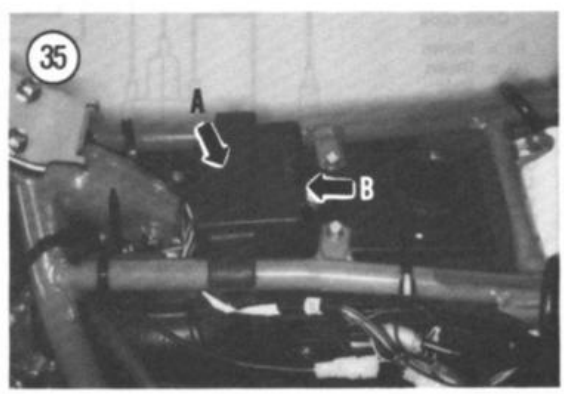
It is not necessary to remove the stator assembly to perform the following tests. To get accurate resistance measurements the stator assembly and coil must be warm (approximately 68° F [20° C]). If you are unable to start the bike to warm up the alternator, use a portable hair dryer and heat the stator assembly.

1. Remove the seat as described in Chapter Thirteen.
2. Remove the fuel tank as described in Chapter Eight.
3. Remove the frame's left-hand side cover.
4. Disconnect the battery negative (–) electrical terminal connector (**Figure 29**).

NOTE

The number of electrical wires and connectors attached to the alternator stator assembly varies among the different models and years.

5. Follow the electrical wire harness from the alternator, up the left-hand frame down tube and to the



area adjacent to the air filter air box. Disconnect the alternator stator source coil electrical connectors containing the white and brown wires.

6. Connect an ohmmeter set at R × 100 and check resistance between the red and the brown wire connector. Test the connector on the source coil side.

7. If there is continuity (specified resistance listed in **Table 2**), the coil is good. If there is no continuity or the resistance is much less or more than specified, check the electrical wires to and within the connector. If they are okay, replace the alternator stator assembly as described in this chapter. The source coil cannot be replaced separately since the pickup coil is an integral part of the stator assembly.

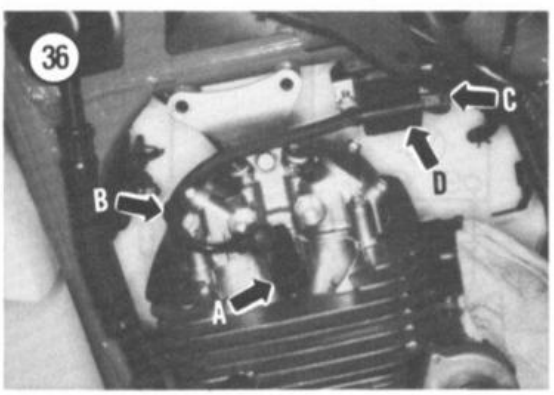
8. Reconnect the electrical connectors and the battery negative connector.

9. Install the frame's left-hand side cover, fuel tank and the seat.

CDI Unit

Removal/Installation

1. Remove the seat as described in Chapter Thirteen.
2. Remove frame's left- and right-hand side cover.
3. Disconnect the battery negative (–) electrical terminal connector (**Figure 29**).
4. Carefully pull up on the CDI rubber mount (A, **Figure 35**) from the frame.
5. Slide the CDI unit (B, **Figure 35**) out of the rubber mount.
6. Disconnect all electrical connectors from the CDI unit.
7. Install by reversing these removal steps while noting the following:
   a. Before connecting the electrical wire connectors at the CDI unit, make sure the connectors are clean of any corrosion, dirt or moisture.
   b. Make sure all electrical connectors are tight.
   c. Be sure the rubber mount is securely mounted on the frame.



Testing

The CDI unit should be tested by a Suzuki mechanic familiar with capacitor discharge ignition testing. Improper testing of a good unit can damage it.

IGNITION COIL

Removal/Installation

1. Remove the seat as described in Chapter Thirteen.
2. Remove the fuel tank as described in Chapter Eight.
3. Remove the frame's left-hand side cover.
4. Disconnect the battery negative (–) electrical terminal connector (**Figure 29**).
5. On California models, remove the Evaporation Emission Control assembly as described in Chapter Eight.
6. Disconnect the spark plug lead (A, **Figure 36**) from the spark plug.
7. Unhook the spark plug lead from the clip (B, **Figure 36**) on the cylinder head cover.
8. Disconnect the coil primary electrical wire (C, **Figure 36**) at the electrical connector on the ignition coil.
9. Remove the screws securing the ignition coil (D, **Figure 36**) and remove the coil from the mounting bracket on the frame.
10. Install by reversing these removal steps while noting the following:
    a. Make sure to correctly connect the primary electrical wires to the coil and the spark plug leads to the spark plug.
    b. Make sure all electrical connectors are free of corrosion and are tight.

Dynamic Test

Disconnect the high voltage lead from the spark plug. Remove the spark plug from the cylinder head as described in Chapter Three. Connect a new or known good spark plug to the high voltage lead and place the spark plug base on a good ground like the engine cylinder head. Position the spark plug so you can see the electrodes.

WARNING

If it is necessary to hold the high voltage lead, do so with an insulated pair of pliers. The high voltage generated could produce serious or fatal shocks.

Use the kickstarter, or starter motor, and turn the engine over a couple of times. If a fat blue spark occurs the coil is in good condition; if not it must be replaced. Make sure that you are using a known good spark plug for this test. If the spark plug used is defective the test results will be incorrect.

Reinstall the spark plug in the cylinder head and reconnect the spark plug lead.

Resistance Testing

The ignition coil is a form of transformer which develops the high voltage required to jump the spark plug gap. The only maintenance required is that of keeping the electrical connections clean and tight and occasionally checking to see that the coil is mounted securely to the bracket.

If the coil condition is doubtful, there are several checks which may be made. Disconnect all ignition coil wires before testing.

NOTE

In order to get accurate resistance measurements the coil must be at approximately 60° F (20° C).

1. Disconnect the spark plug lead (A, **Figure 36**) from the spark plug.
2. Disconnect the coil primary electrical wire (C, **Figure 36**) at the electrical connector on the ignition coil.
3. Measure the coil primary resistance using an ohmmeter set at R × 1. Measure between the primary terminal (orange wire) and ground (**Figure 37**). Resistance is specified in **Table 1**.
4. Measure the secondary resistance using an ohmmeter set at R × 100. Measure between the secondary lead (spark plug lead) and the orange coil wire (**Figure 38**). Resistance is specified in **Table 1**.

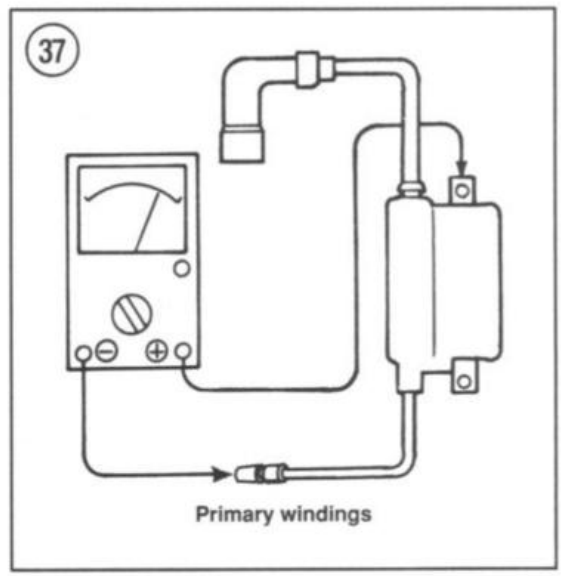
NOTE

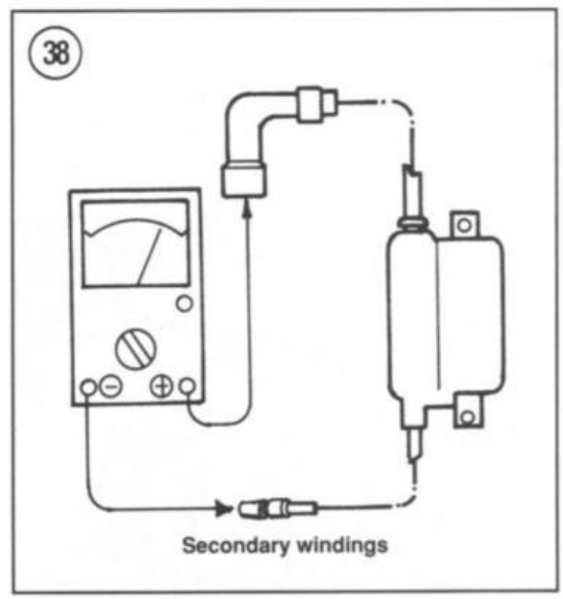
If the coil test readings are marginal, prior to replacing the coil, have the coil tested by a Suzuki dealer using a spark gap tester. This test is a better indication of the coil's performance.

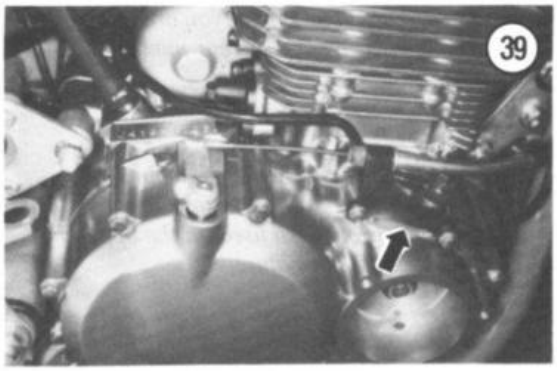
5. If the coil resistance does not meet either of these specifications, the coil must be replaced.
6. Replace the coil if the spark plug lead shows visible damage.
7. If the coil tests okay, reconnect the electrical connectors.

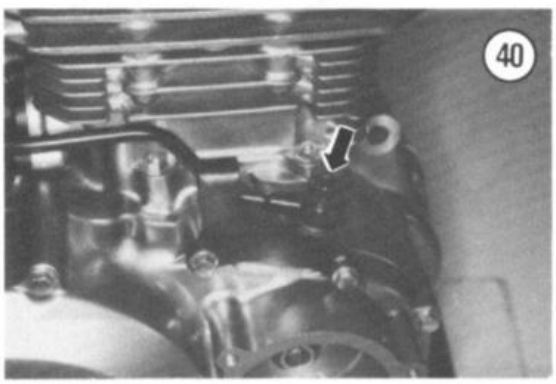
SPARK PLUG

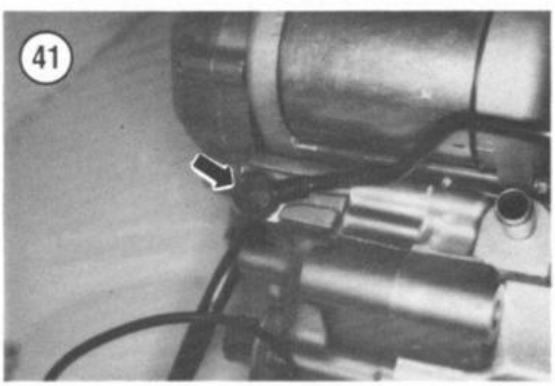
The spark plug recommended by the factory is usually the most suitable for your machine. If riding

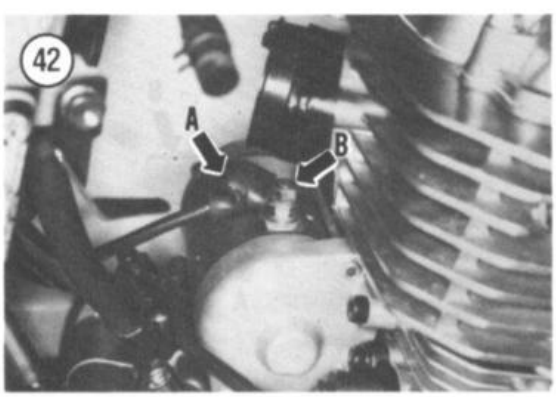












conditions are mild, it may be advisable to go to a spark plug one step hotter than normal. Unusually severe riding conditions may require slightly colder plugs. See Chapter Two and Chapter Three for details.

STARTING SYSTEM

The starting system consists of the starter motor, starter gears, solenoid and the starter button.

The layout of the starting system is shown in **Figure 33**. When the starter button is pressed, it engages the starter solenoid switch that completes the circuit allowing electricity to flow from the battery to the starter motor.

CAUTION

Do not operate the starter for more than 5 seconds at a time. Let it rest approximately 10 seconds, then use it again.

The starter gears are covered in Chapter Five. **Table 3** lists possible starter problems, probable causes and most common remedies.

9

STARTER

Removal/Installation

1. Place the bike on the sidestand.
2. Remove the seat as described in Chapter Thirteen.
3. Remove both frame side covers.
4. Disconnect the battery negative lead (**Figure 29**).
5. Remove exhaust pipe from the engine as described in Chapter Eight. It is not necessary to remove the muffler.
6. Loosen the bolts securing the clutch cable mounting bracket (**Figure 39**) on the clutch cover.

NOTE

The illustrations shown in Step 7 and Step 8 are shown with the engine removed and partially disassembled for clarity.

7. Remove the union bolt and sealing washers securing the oil pipe to the front right-hand side (**Figure 40**) and the rear left-hand side (**Figure 41**).
8. Pull back the rubber boot (A, **Figure 42**) on the electrical connector.

9. Disconnect the black electric starter cable from the starter (B, **Figure 42**).
10. Remove the oil pipe (**Figure 43**) from the crankcase.
11. Remove the cam chain tensioner bolt (A, **Figure 44**).
12. Remove the bolts (B, **Figure 44**) securing the starter to cylinder.
13. Lift up on the right-hand side of the starter and pull the starter toward the right just enough to retract the starter gear from the crankcase.
14. Pull the starter up and out through the right-hand side.
15. Install by reversing these removal steps while noting the following:
    a. Make sure the electrical connector is free of corrosion and is tight.
    b. Install the cam chain tensioner bolt and tighten to the torque specified in **Table 2**.
    c. Install new sealing washers on each side of the oil line union bolts and tighten the union bolts to the torque specified in **Table 2**.

Preliminary Inspection

The overhaul of a starter motor is best left to an expert. This procedure shows how to detect a defective starter.

Inspect the O-ring seal (A, **Figure 45**). O-rings tend to harden after prolonged use and heat and therefore lose their ability to seal properly. Replace as necessary.

Inspect the gear teeth (B, **Figure 45**) for chipped or missing teeth. If damaged, the starter assembly must be replaced.

Disassembly

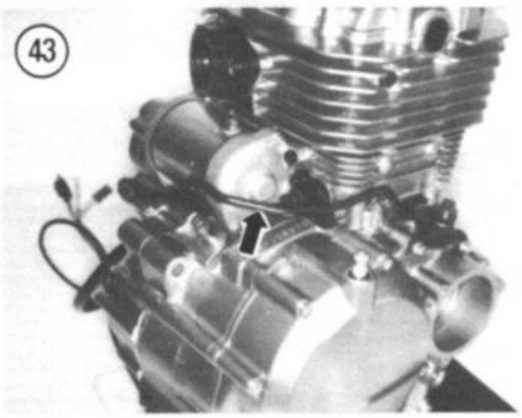
Refer to **Figure 46** for this procedure.
1. Remove the 2 long case screws (A, **Figure 47**).
2. Slide the rear cover (**Figure 48**) off of the armature shaft.

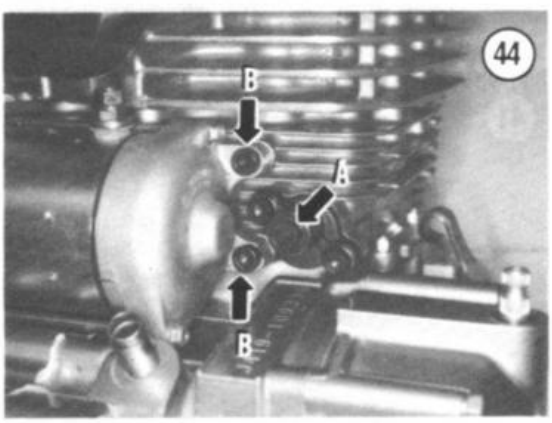
NOTE

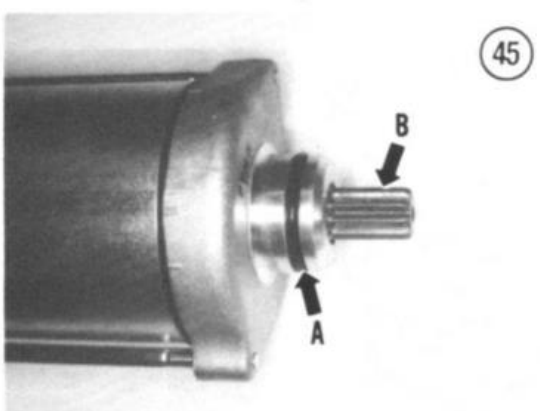
Write down the number of shims used on the shaft next to the commutator and next to the rear cover. Be sure to install the same number, and on the correct end, when reassembling the starter. The number of shims used in each starter varies. The starter shown in ***Figure 49*** *uses 3 shims. The starter you are working on may use a different number of shims.*

NOTE

Labeling and storing these shims removed in Step 3 is important because other shims are also used on the opposite side of the armature.







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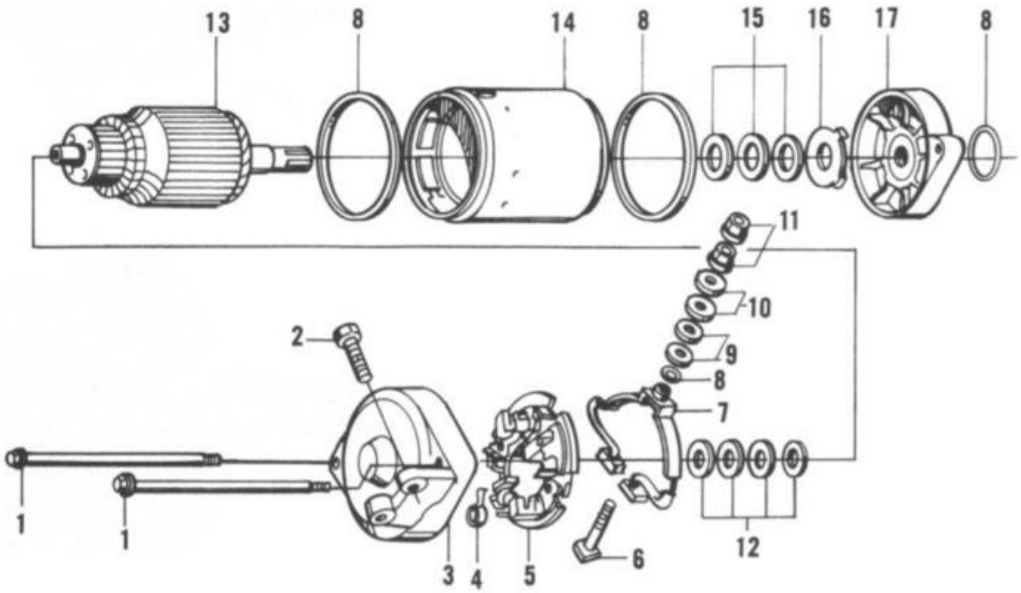
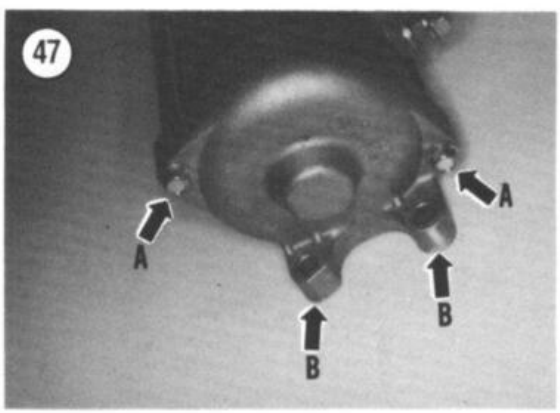
STARTER



1. Case bolt
2. Bolt
3. Rear cover
4. Brush spring
5. Brush holder and negative brushes
6. Bolt
7. Positive brush holder
8. O-ring
9. Insulated washers
10. Washers
11. Nuts
12. Washer and shims
13. Armature
14. Case
15. Shims
16. Lockwasher
17. Front cover

9

47



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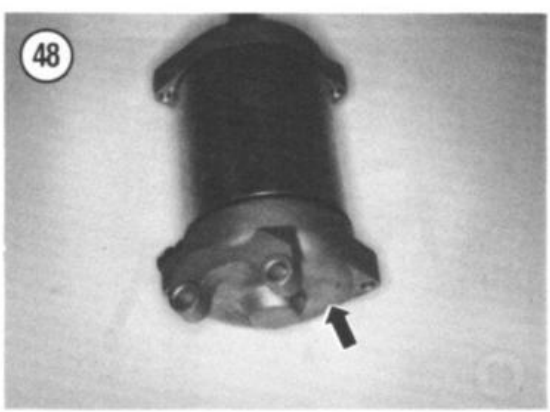


3. First slide off the washer (A, **Figure 49**), then slide the shims (B, **Figure 49**) off of the armature shaft. Record the number of shims and their location. Store the shims in a marked plastic bag.
4. Slide the front cover (**Figure 50**) off of the case.
5. Slide the shims (**Figure 51**) off this end of the armature shaft. Record the number of shims and their location. Store the shims in a marked plastic bag.
6. Remove the lockwasher (**Figure 52**) from the end cover.
7. Slide the armature (A, **Figure 53**) out of the case (B, **Figure 53**).
8. Clean all grease, dirt and carbon from the armature, case and both end caps.

CAUTION

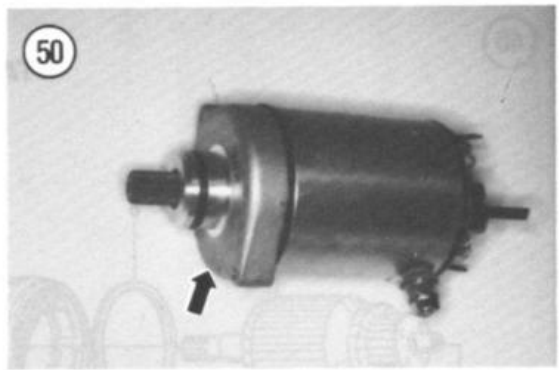
Do not immerse the wire windings in the case or the armature coil in solvent as the insulation may be damaged. Wipe the windings with a cloth lightly moistened with solvent and thoroughly dry.

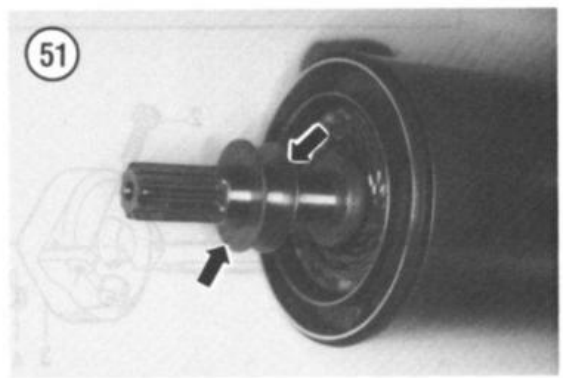
Inspection

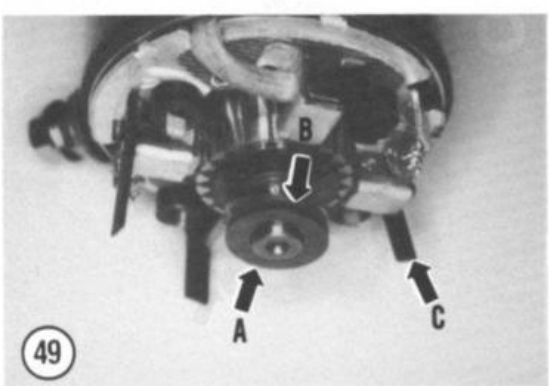
NOTE

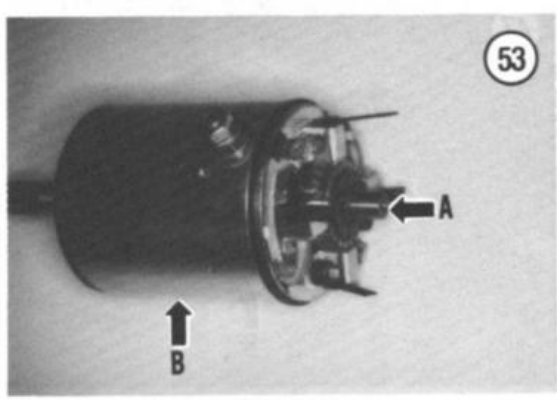
*The cable terminal assembly (**Figure 54**) for the positive brush set is composed of an O-ring, insulated washers, regular washers and nuts. Label each component when removed, especially the insulated washers, as they must be reinstalled in the same order to insulate the brushes from the case.*

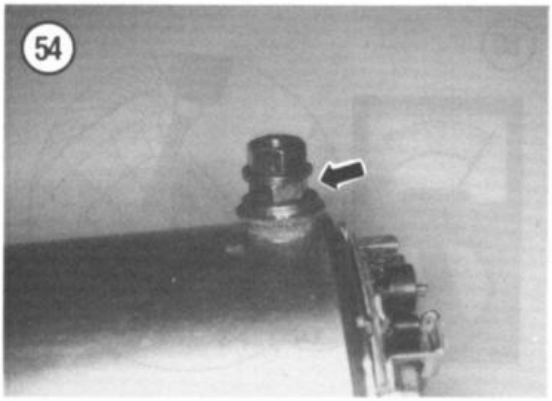
1. To replace the brush holder assembly, perform the following:
   a. Remove the nuts from the cable terminal and slide off the regular washer.

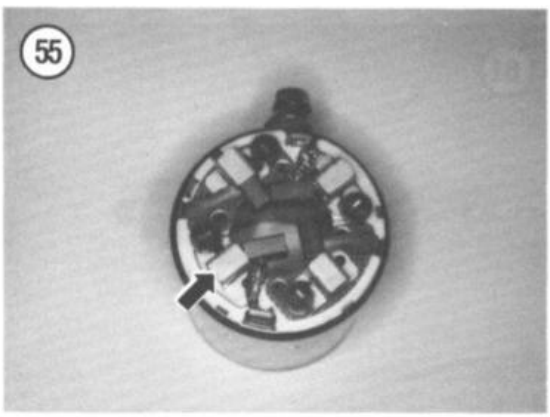


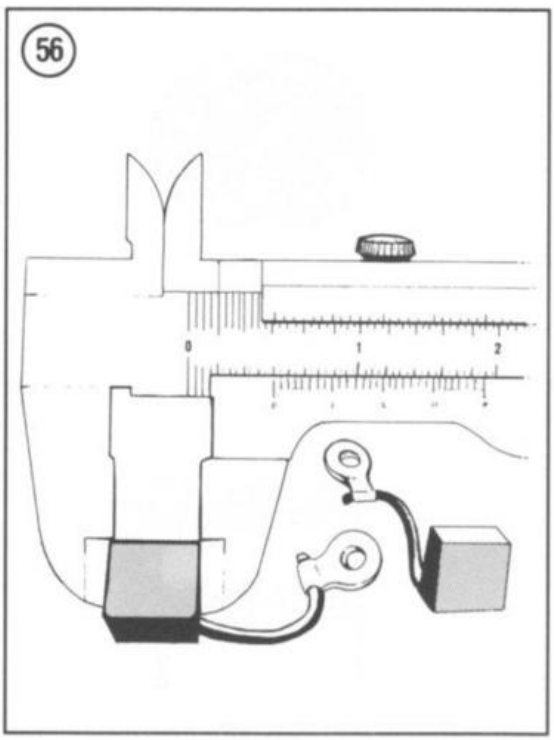










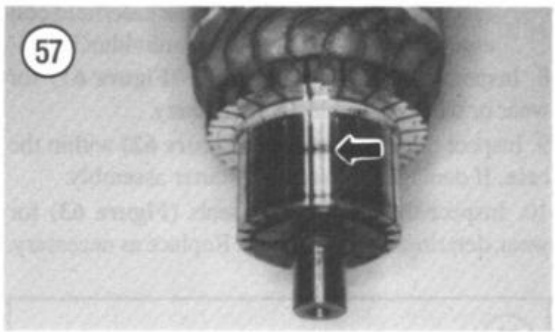


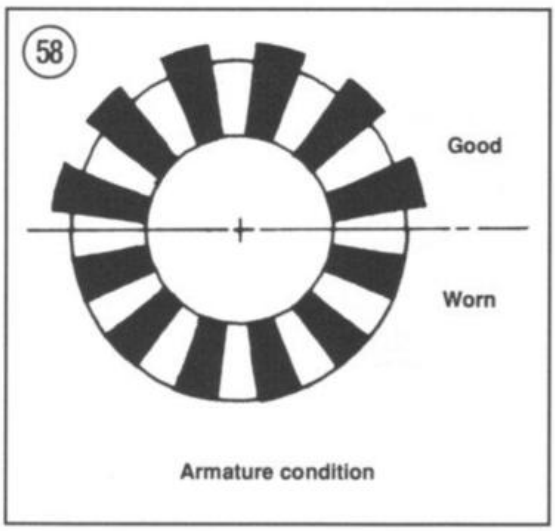
b. Remove the large insulated washer and the 2 small insulated washers.
c. Slide the O-ring off of the cable terminal.
d. Push the cable terminal into the case and remove the brush holder assembly (**Figure 55**).
e. Install the brush holder assembly by reversing these removal steps. Make sure to install the nut and washers in their original order.

2. Pull the spring away from each brush and pull the brushes out of their guides.

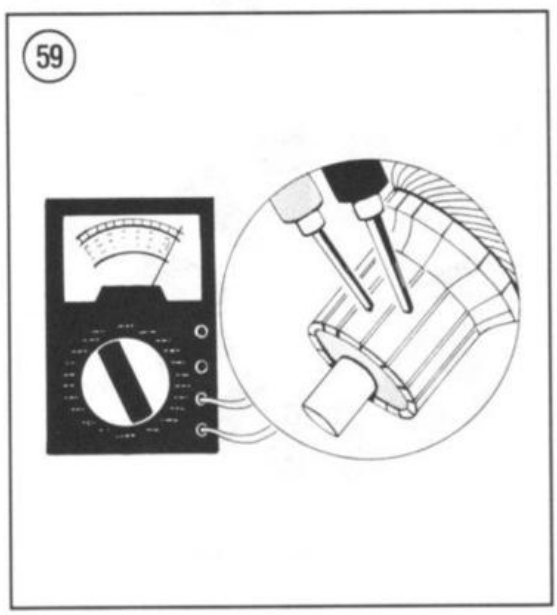
3. Measure the length of each brush with a vernier caliper (**Figure 56**). If the length is 3.5 mm (0.14 in.) or less for any one of the brushes, the brush holder assemblies must be replaced. The brushes cannot be replaced individually.

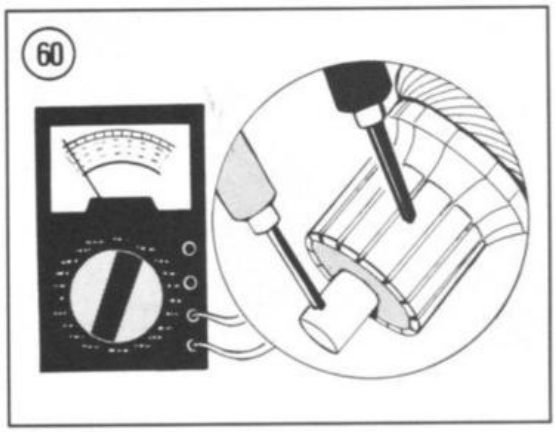
4. Inspect the commutator (**Figure 57**). The mica in a good commutator is below the surface of the copper bars. On a worn commutator the mica and copper bars may be worn to the same level (**Figure 58**). If necessary, have the commutator serviced by a dealer or electrical repair shop.

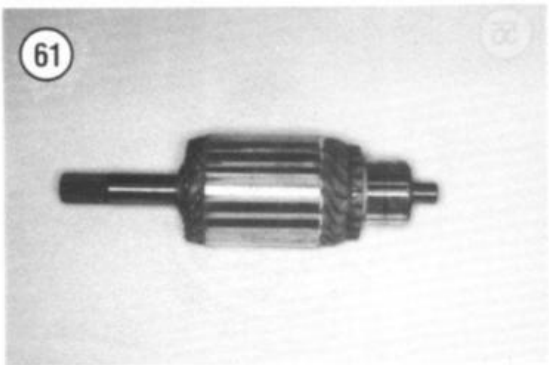


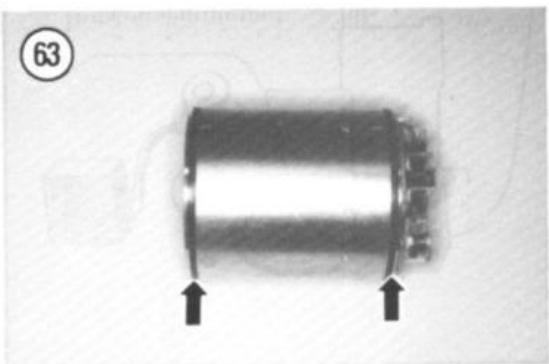


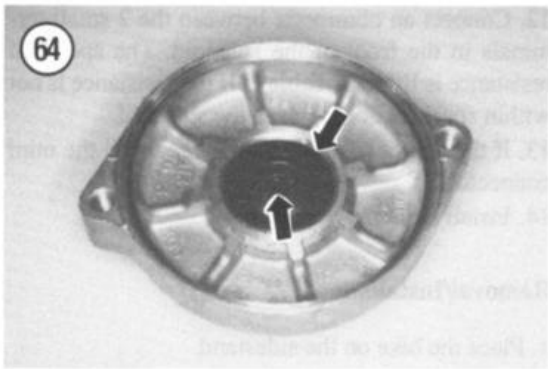
5. Inspect the commutator copper bars for discoloration. If a pair of bars are discolored, grounded armature coils are indicated.
6. Use an ohmmeter and perform the following:
   a. Check for continuity between the commutator bars (**Figure 59**); there should be continuity (indicated resistance) between pairs of bars.
   b. Check for continuity between the commutator bars and the shaft (**Figure 60**); there should be *no* continuity (infinite resistance).
   c. If the unit fails either of these tests, the starter assembly must be replaced. The armature cannot be replaced individually.
7. Use an ohmmeter and perform the following:
   a. Check for continuity between the starter cable terminal and the case; there should be continuity (indicated resistance).
   b. Check for continuity between the starter cable terminal and the brush black wire terminal; there should be *no* continuity (infinite resistance).
   c. If the unit fails either of these tests, the starter assembly must be replaced. The case/field coil assembly cannot be replaced individually.
8. Inspect the armature assembly (**Figure 61**) for wear or damage. Replace if necessary.
9. Inspect the inner magnets (**Figure 62**) within the case. If damaged, replace the starter assembly.
10. Inspect the case O-ring seals (**Figure 63**) for wear, deterioration or damage. Replace as necessary.

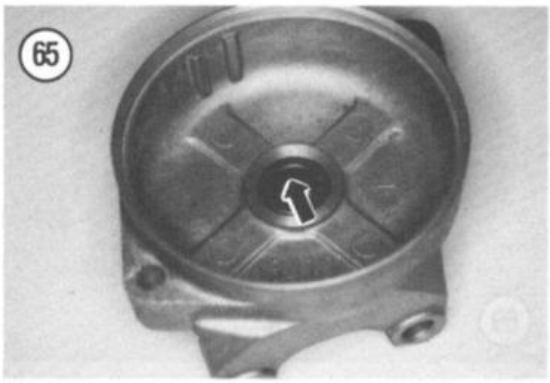


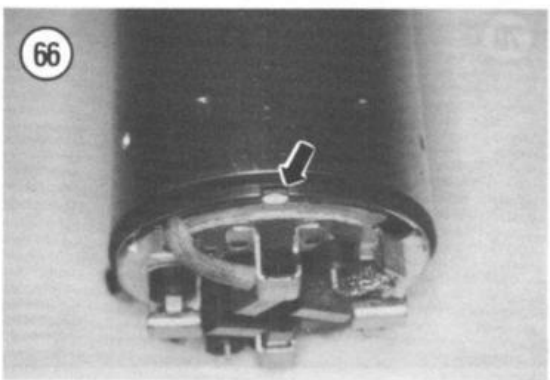


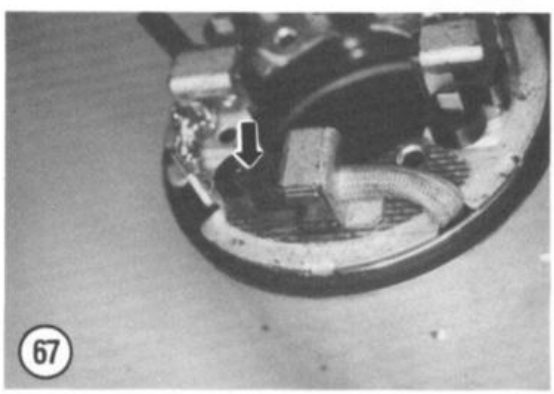












11. Inspect the oil seal and bearing (**Figure 64**) in the front cover for wear or damage. If either is damaged, replace the starter assembly as these parts are not available separately.

12. Inspect the bushing (**Figure 65**) in the rear cover for wear or damage. If it is damaged, replace the starter assembly as this part is not available separately.

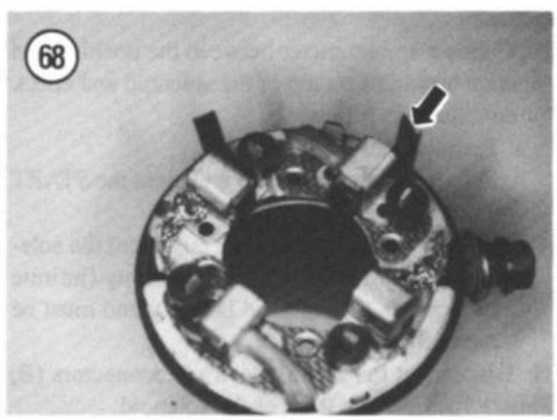
Assembly

1. Install the brush holder assembly in the rear cover. Align the holder locating tab with the notch in the case (**Figure 66**).

2. If removed, install the brushes into their holders and secure them as follows:
   a. Cut 4 pieces from a large tie wrap about 1 inch long.
   b. Correctly position the spring within its holder.
   c. Install the brush into the holder.
   d. Push the brush all the way back into the holder, then insert the piece of tie wrap between the end of the spring and brush holder (**Figure 67**). This will keep the spring pressure off the brush keeping the brush within the holder to ease the installation of the commutator past the withdrawn brushes.
   e. Repeat for all 4 brushes (**Figure 68**).

3. Install the armature (A, **Figure 53**) into the case (B, **Figure 53**). After the armature is correctly positioned, remove all 4 tie wrap strips (C, **Figure 49**) allowing the brushes to correctly contact the commutator.

4. Make sure the two O-rings (**Figure 63**) are installed on the case. Apply a light coat of clean engine oil to the O-rings.



5. Install the shims (**Figure 51**) on the shaft.
6. Apply a light coat of molybdenum disulfide grease to each end of the armature shaft where the end covers ride.
7. Install the lockwasher (**Figure 52**) onto the front cover so that the lockwasher tabs engage the cover slots.
8. Install the front cover (**Figure 50**).
9. Install the shims (B, **Figure 49**) and washer (A, **Figure 49**).
10. Install the rear cover (**Figure 48**).
11. Align the mark on the case and end cover (A, **Figure 69**).
12. Apply blue Loctite (No. 242) onto the case screw threads and install the screws (B, **Figure 69**). Tighten the screws securely.
13. Clean the cover mounting lugs (B, **Figure 47**) of all dirt and other contaminates as they act as the ground for the starter motor.

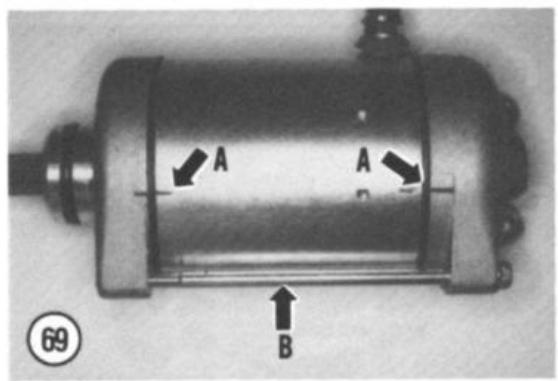
STARTER SOLENOID

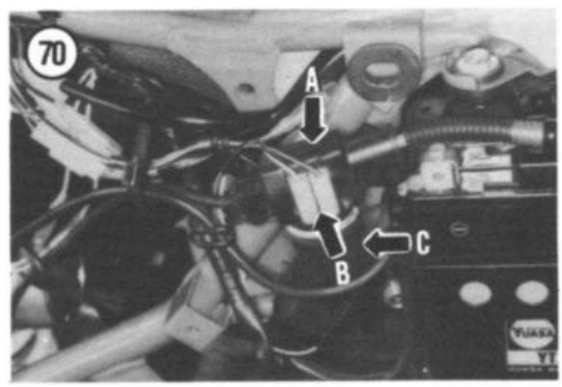
Testing

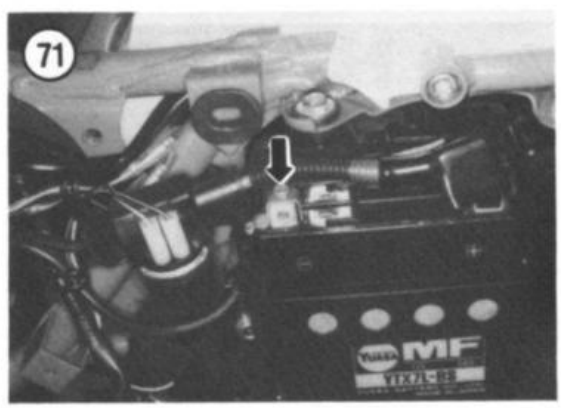
1. Place the bike on the sidestand.
2. Remove the seat as described in Chapter Thirteen.
3. Remove the left-hand side cover.
4. Shift the transmission to NEUTRAL.
5. Turn the ignition switch ON and pull in on the clutch lever.
6. Press the START button. The solenoid should click. If it does not click, proceed to Step 7.
7. Turn the ignition switch OFF.
8. Remove the rubber protective cover (A, **Figure 70**).
9. Remove the nut and disconnect the electrical wire from the side of the solenoid leading to the starter motor.
10. Connect an ohmmeter between the positive and negative terminals on top of the solenoid and check for continuity as follows:
    a. Turn the ignition switch ON.
    b. Pull in on the clutch lever and press the START button.
    c. If there is continuity (low resistance) the solenoid is okay. If there is no continuity (infinite resistance), the solenoid is faulty and must be replaced.
11. Disconnect the 2 mini electrical connectors (B, **Figure 70**) from the front of the solenoid.
12. Connect an ohmmeter between the 2 small terminals in the front of the solenoid. The specified resistance is listed in **Table 1**. If the resistance is not within specification, replace the solenoid.
13. If the starter solenoid is okay, reinstall the mini connectors.
14. Install all items removed.

Removal/Installation

1. Place the bike on the sidestand.







2. Remove the seat as described in Chapter Thirteen.
3. Remove the left-hand side cover.
4. Disconnect the battery negative lead (**Figure 71**).
5. Remove the rubber protective cover (A, **Figure 70**).
6. Remove the nuts and disconnect both electrical wire from the top of the solenoid.
7. Disconnect the 2 mini electrical connectors (B, **Figure 70**) from the front of the solenoid.
8. Remove the screws securing the solenoid (C, **Figure 70**) and remove it from the frame.
9. Install by reversing these removal steps while noting the following:
   a. Install both electrical wires to the solenoid and tighten the nuts securely.
   b. Make sure the electrical connectors are on tight and that the rubber protective cover is properly installed to keep out moisture.
   c. Install all items removed.

LIGHTING SYSTEM (DR250S AND DR350S)

The lighting system consists of a headlight, taillight, turn signals, indicator bulbs and meter illumination bulbs.

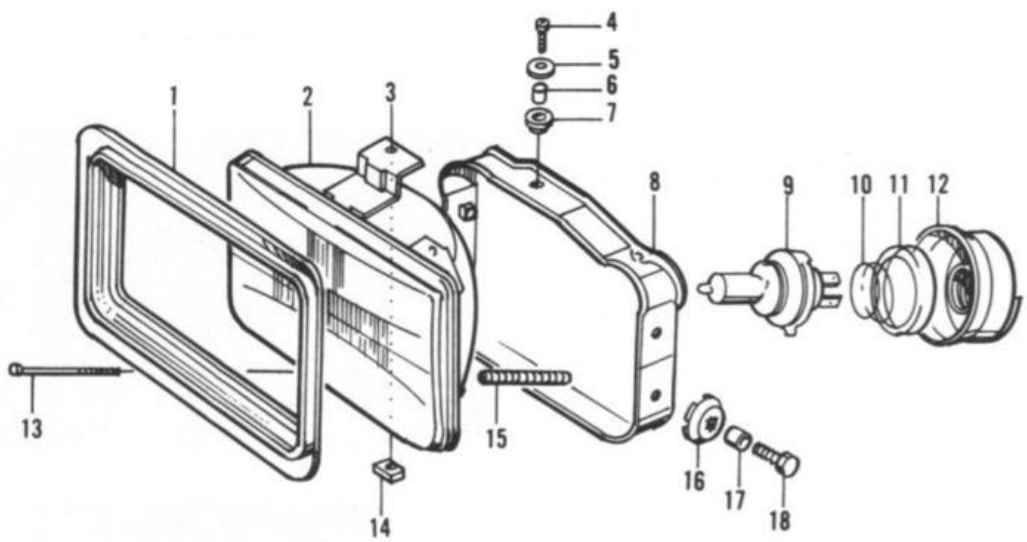
Always use the correct wattage bulb. A larger wattage bulb will give a dim light and a smaller wattage bulb will burn out prematurely. **Table 4** lists bulb sizes.

Headlight Bulb Replacement

Refer to **Figure 72** for this procedure.

1. Remove the headlight housing as described in this chapter.
2. Disconnect the electrical connector from the back of the bulb.
3. Remove the rubber cover.

(72) **HEADLIGHT ASSEMBLY (DR250S AND DR350S)**



1. Bezel (models so equipped)
2. Lens assembly
3. Bracket
4. Screw
5. Washer
6. Collar
7. Rubber cushion
8. Lens mounting bracket
9. Bulb
10. Spring
11. Bulb holder
12. Rubber cover
13. Adjust screw
14. Nut
15. Spring
16. Rubber cushion
17. Collar
18. Bolt

4. Carefully push in and then turn the bulb holder and remove it from the lens assembly.
5. Remove the bulb from the socket.

CAUTION

Do not touch the bulb glass with your fingers because oil on your skin will transfer to the glass. Any traces of oil on the quartz halogen bulb will drastically reduce the life of the bulb. Clean any traces of oil from the bulb with a cloth moistened in alcohol or lacquer thinner.

6. Install by reversing these removal steps. Adjust the headlight as described in this chapter.

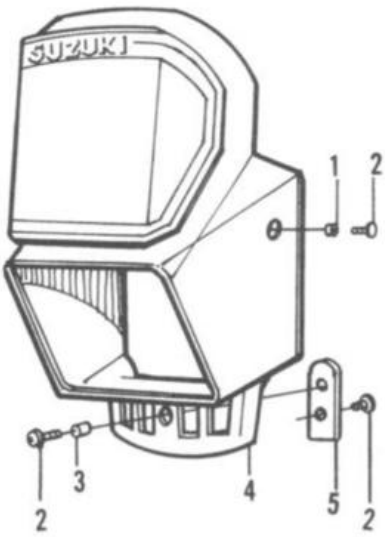
Headlight Lens and Lens Mounting Bracket Removal/Installation

Refer to **Figure 72** and **Figure 73** for this procedure.
1. Disconnect the electrical connector (**Figure 74**) from the back of the bulb.
2. Remove the lower screw and collar (A, **Figure 75**) securing the lower portion of the headlight fairing.
3. Remove the side screw and collar (B, **Figure 75**) on each side securing the headlight fairing on each side and remove the headlight fairing (C, **Figure 75**).
4. Remove the bolts (A, **Figure 76**) on each side securing the headlight lens assembly and bracket to the mounting brackets on the fork tubes. Don't lose the metal collar in each rubber bushing in the lens mounting bracket.
5. Remove the headlight lens and bracket (B, **Figure 76**).
6. Install by reversing these removal steps noting the following:
   a. Make sure the electrical connector is free of corrosion and is tight.
   b. Adjust the headlight as described in this chapter.

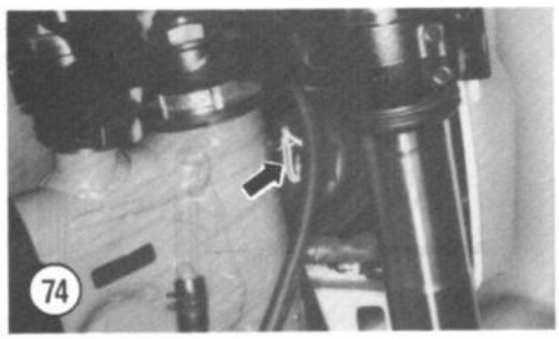
Headlight Assembly Mounting Brackets Removal/Installation

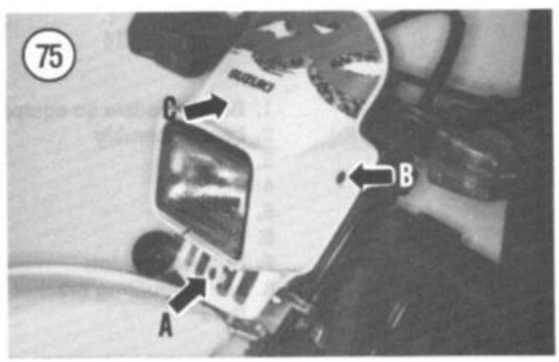
1. Remove both fork assemblies as described in Chapter Ten.
2. Remove the headlight fairing (A, **Figure 77**) and headlight lens and lens mounting bracket assembly as described in this chapter.
3. The brackets are not symmetrical and must be installed on the correct side of the bike. Mark them

73 HEADLIGHT COVER (DR250S AND DR350S)



1. Collar
2. Screw
3. Collar
4. Cover
5. Mounting bracket





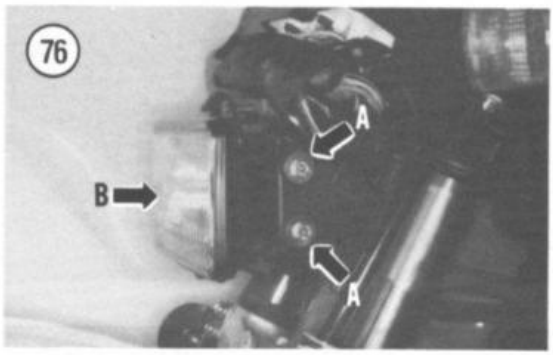
with a "R" (right) and "L" (left) so they will be installed correctly. If installed on the wrong side of the bike, you will not be able to install the headlight lens and lens mounting bracket assembly.

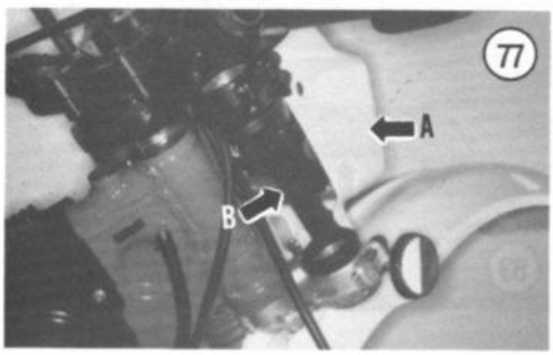
4. Carefully work the rubber grommets free from the upper and lower fork bridges and remove the headlight assembly mounting brackets (B, **Figure 77**).

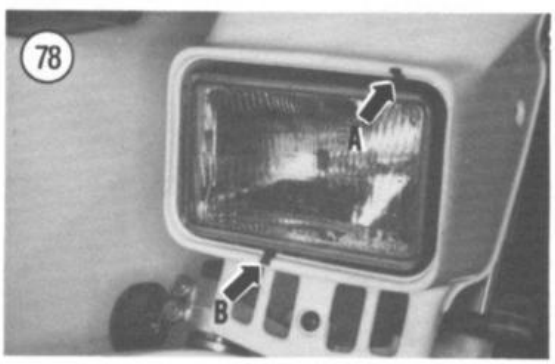
5. Install by reversing these removal steps while noting the following:

a. Apply a light coat of rubber lube or Armor All to the rubber grommets to ease their installation into the fork bridges.

b. Make sure the grommets are properly seated otherwise fork installation will be difficult.







Headlight Beam Adjustment

The headlight beam can be set for vertical and horizontal adjustments.

1. Park the bike on level ground. Block the sidestand to level the bike.

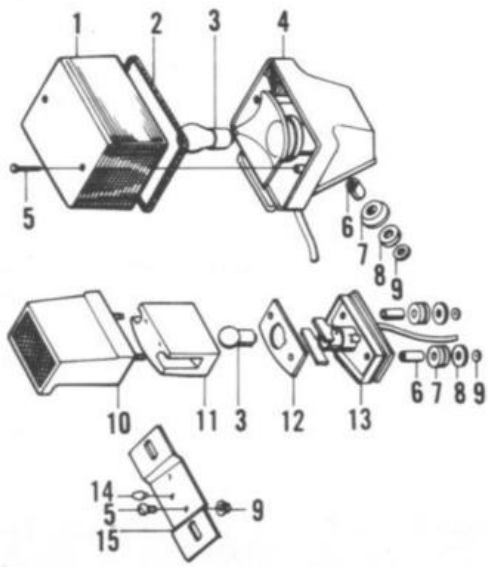
2. *Horizontal adjustment*: Turn the upper adjusting screw (A, **Figure 78**) *clockwise* to adjust the beam to the left. Turn the adjusting screw *counterclockwise* to adjust the beam to the right.

3. *Vertical adjustment*: Turn the lower adjusting screw (B, **Figure 78**) *clockwise* to lower the beam. Turn the adjusting screw *counterclockwise* to raise the beam.

Taillight/Brake Light Bulb Replacement

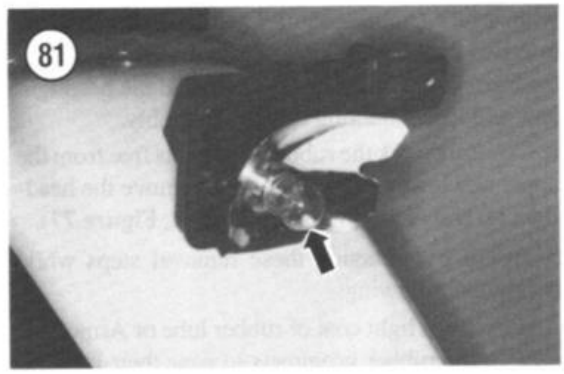
Refer to **Figure 79** for this procedure.

79 TAILLIGHT/BRAKE LIGHT AND LICENSE PLATE LIGHT (DR250S AND DR350S)



1. Lens
2. Gasket
3. Bulb
4. Taillight/brake light housing
5. Screw
6. Collar
7. Rubber cushion
8. Washer
9. Nut
10. License plate light cover
11. Lens
12. Gasket
13. License plate light housing
14. Rubber stopper
15. License plate bracket

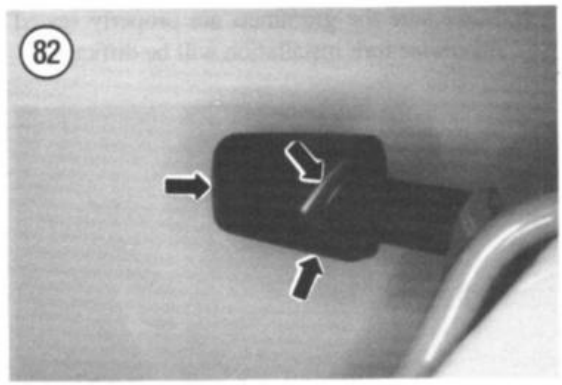
1. Remove the screws (A, **Figure 80**) securing the lens and remove the lens (B, **Figure 80**).
2. Wash the lens with a mild detergent and wipe dry.
3. Inspect the lens gasket and replace it if damaged or deteriorated.
4. Turn the bulb (**Figure 81**) counterclockwise and remove it.
5. Install by reversing these removal steps. When installing the lens, do not overtighten the screws as the lens may crack.



Taillight/Brake Light Assembly Removal/Installation

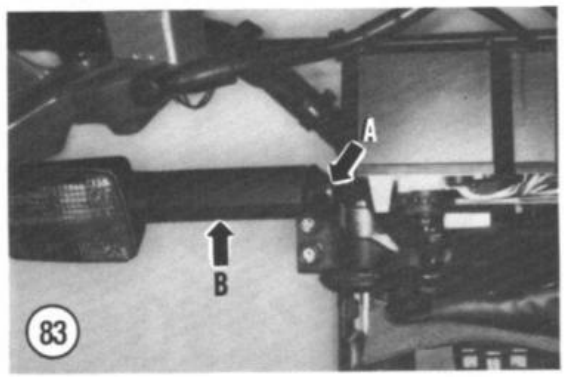
Refer to **Figure 79** for this procedure.

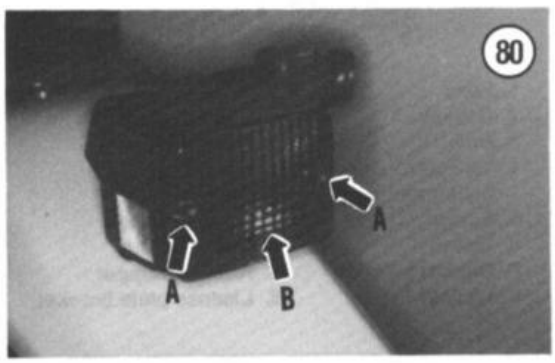
1. Remove the frame side covers and seat as described in Chapter Thirteen.
2. Disconnect the 3-pin electrical connector to the taillight assembly containing 3 wires (1 brown, 1 black/white and 1 white/black). The connector is located on the left-hand side adjacent to the battery.
3. From under the rear fender, remove the nuts and washers securing the assembly to the rear fender and remove the assembly. Don't lose the collar in each rubber mounting cushion.
4. Install by reversing these removal steps. Make sure the electrical connector is free of corrosion and is tight.

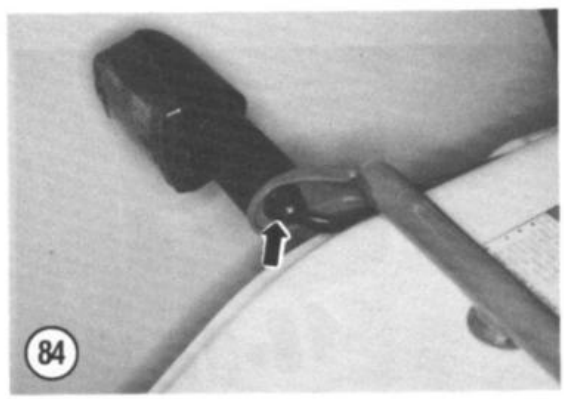


Turn Signal Light Replacement

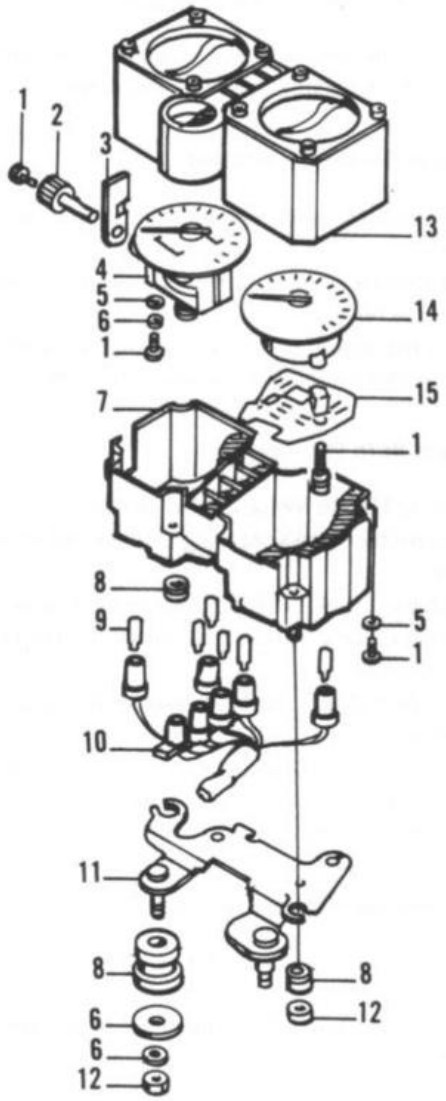
1. Loosen the screws (**Figure 82**) securing the lens. The lens will usually come off leaving the screws still within the housing.
2. Remove the lens and wash the inside of the lens with a mild detergent.
3. Inspect the lens gasket and replace it if damaged or deteriorated.







(85) METER ASSEMBLY (DR250S AND DR350S)



1. Screw
2. Trip knob
3. Grommet
4. Speedometer
5. Washer
6. Lockwasher
7. Case
8. Rubber grommet
9. Bulb
10. Socket and electrical harness
11. Mounting bracket
12. Nut
13. Meter hood
14. Tachometer
15. Spacer

4. Turn the bulb *counterclockwise* and remove it.

5. Install by reversing these removal steps while noting the following:

a. If the screws came completely out of the housing, make sure the small rubber gasket is in place on each screw prior to installation. These gaskets prevent moisture from entering the housing.

b. When installing the lens, do not overtighten the screws as the lens may crack.

Turn Signal Assembly Removal/Installation

1A. To remove the front turn signal assembly, perform the following:

a. Remove the lower screw and collar (A, **Figure 75**) securing the lower portion of the headlight fairing.

b. Remove the side screw and collar (B, **Figure 75**) on each side securing the headlight fairing on each side and remove the headlight fairing (C, **Figure 75**).

c. Disconnect the 2-pin electrical connector to the turn signal assembly containing 2 wires (black and white/black).

d. Remove the nut (A, **Figure 83**) securing the turn signal assembly to the frame tab mounting bracket.

1B. To remove the rear turn signal assembly, perform the following:

a. Remove both frame side covers and the seat as described in Chapter Thirteen.

b. Disconnect the 2-pin electrical connector to the turn signal assembly containing 2 wires (black and white/black).

c. Remove the nut (**Figure 84**) securing the turn signal assembly to the mounting bracket.

2. Carefully pull the turn signal assembly (B, **Figure 83**) and electrical wires out of the mounting bracket.

3. Install by reversing these removal steps. Make sure the electrical connector is free of corrosion and is tight.

Indicator Bulb Replacement

Refer to **Figure 85** for this procedure.

1. Remove the lower screw and collar (A, **Figure 75**) securing the lower portion of the headlight fairing.

2. Remove the side screw and collar (B, **Figure 75**) on each side securing the headlight fairing on each side and remove the headlight fairing (C, **Figure 75**).
3. Carefully pull the bulb socket (**Figure 86**) out of the back side of the meter housing. Remove and replace the bulb(s) (**Figure 87**).
4. Install by reversing these removal steps.

LIGHTING SYSTEM (DR250 AND DR350)

When replacing bulbs, always use the correct wattage bulb. A larger wattage bulb will give a dim light and a small wattage bulb will burn out prematurely. **Table 4** lists bulb sizes.

Headlight Bulb Replacement

Refer to **Figure 88** for this procedure.
1. Remove the lower screw and washer securing the lower portion of the headlight fairing.
2. Carefully pull up on the fairing and unhook the single rubber strap securing the fairing at the top and remove the fairing.
3. Remove the screw, lockwasher and washer on each side securing the lens assembly to the mounting bracket.
4. Pull the lens assembly forward to gain access to the backside.
5. Disconnect the electrical connector from the bulb.
6. Remove the socket cover and bulb.

CAUTION
Do not touch the bulb glass with your fingers because oil on your skin will transfer to the glass. Any traces of oil on the quartz halogen bulb will drastically reduce the life of the bulb. Clean any traces of oil from the bulb with a cloth moistened in alcohol or lacquer thinner.

7. Remove the bulb and replace with a new bulb.
8. Install by reversing these removal steps.

Headlight Beam Adjustment

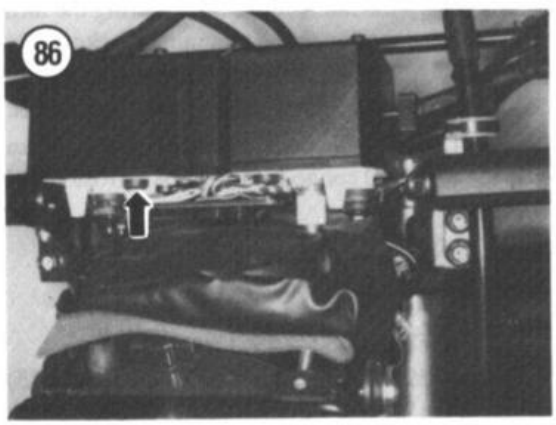
The headlight beam can only be set for vertical adjustment.
1. Park the bike on level ground. Block the sidestand to level the bike.
2. Turn the adjusting screw *clockwise* to raise the beam or *counterclockwise* to lower the beam.

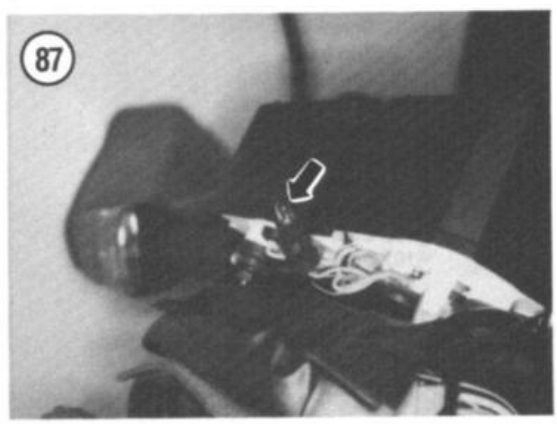
Taillight Bulb Replacement

Refer to **Figure 89** for this procedure.
1. Remove the screws securing the lens and remove the lens.
2. Wash the lens with a mild detergent and wipe dry.
3. Inspect the lens gasket and replace it if damaged or deteriorated.
4. Push in and turn the bulb *counterclockwise* and remove it.
5. Install by reversing these removal steps. When installing the lens, do not overtighten the screws as the lens may crack.

A.C. Lighting Circuit Output Test

1. Remove the seat as described in Chapter Thirteen.
2. Connect a portable tachometer following the manufacturer's instructions.





NOTE

The taillight 2-pin electrical connector is located on the upper left-hand side of the bike just behind the CDI unit.

3. Locate the taillight 2-pin electrical connector containing 2 wires (1 yellow and 1 black/white). Do *not* disconnect this connector—it is to remain connected for this test.
4. Connect the test leads from an AC voltmeter into the connector terminal. Make sure the ends of the test leads touch the metal pin within the connector otherwise the results will be false.
5. Switch the voltmeter to the AC 25 V scale.
6. Start the engine and warm to normal operating temperature.
7. Gradually increase engine speed to 5,000 rpm. At 5,000 rpm note the voltmeter reading and then turn the engine off. If the voltage is not between 12-14V AC, perform the *Lighting Coil Resistance Check* and *Regulator Check* in this section.
8. Disconnect the voltmeter and tachometer.
9. Install the seat.

Lighting Coil Resistance Check

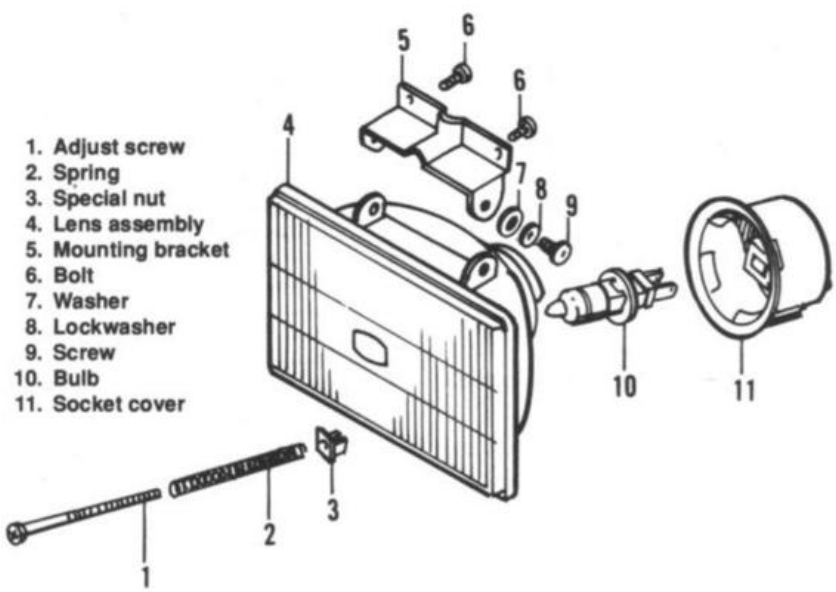
1. Remove the seat as described in Chapter Thirteen.
2. Connect a portable tachometer following the manufacturer's instructions.

NOTE

The alternator 2-pin electrical connector is located on the upper right-hand side of the bike just ahead the CDI unit.

3. Locate the lighting coil 2-pin electrical connector containing 2 wires (1 yellow and 1 black/white) and disconnect this connector.
4. Connect an ohmmeter between the yellow and black/white connector leads. Set the ohmmeter on the R × 1 scale. Replace the lighting coil if the reading is not within specifications listed in **Table 1**. Refer to *Alternator* in this chapter.
5. Remove the ohmmeter and reconnect the electrical connector.
6. Install the seat.

(88) **HEADLIGHT ASSEMBLY (DR250 AND DR350)**



Regulator Test

1. Remove the seat as described in Chapter Thirteen.
2. Disconnect the 2-pin electrical connector containing 2 wires (1 yellow and 1 black/white) from the regulator located on top of the air filter air box behind the CDI unit.
3. Set the ohmmeter on the R × 1 scale. Connect an ohmmeter between the No. 1 and No. 2 leads (**Figure 90**) as follows:
   a. Ohmmeter positive (+) test lead to the regulator No. 2 terminal and the negative (–) test lead to the No. 1 terminal. The ohmmeter should read infinity.
   b. Reverse the test leads. The specified resistance is 7 ohms.
4. Replace the regulator if the reading is not within specifications.
5. Remove the ohmmeter and reconnect the electrical connector.
6. Install the seat.

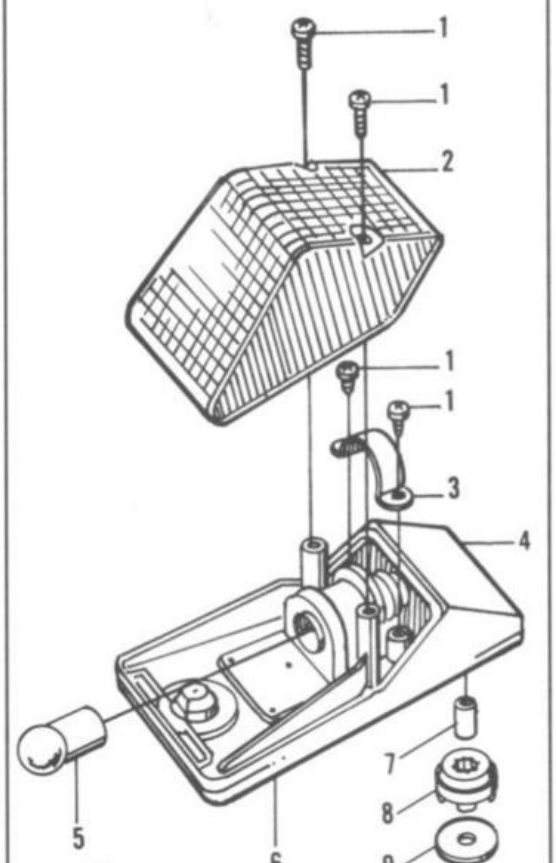
ELECTRICAL COMPONENTS

Speedometer and Tachometer Housing and Bracket (DR250S and DR350S) Removal/Installation

Refer to **Figure 85** for this procedure.

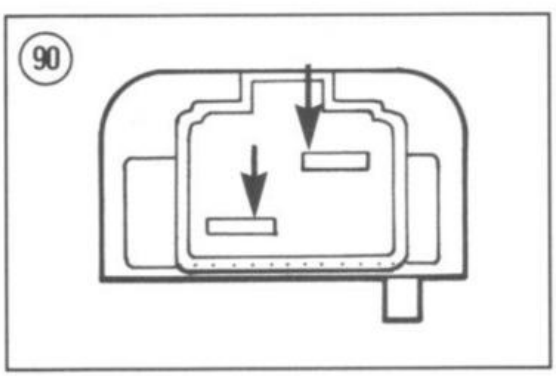
1. Remove the lower screw and collar (A, **Figure 75**) securing the lower portion of the headlight fairing.
2. Remove the side screw and collar (B, **Figure 75**) on each side securing the headlight fairing on each side and remove the headlight fairing (C, **Figure 75**).
3. Disconnect the speedometer cable (**Figure 91**) at the base of the meter housing.
4. Open the electrical harness connector cover (**Figure 92**).
5. Locate and disconnect the following electrical connectors:
   a. The 6-pin meter electrical connector containing 6 wires (1 blue, 1 light green, 1 black, 1 orange, 1 black/white and 1 green).
   b. The 2 individual connectors (1 yellow and 1 white/red) from the meter assembly.
   c. The 6-pin ignition switch electrical connector containing 5 wires (1 red, 1 orange, 1 black/white, 1 green and 1 brown).
   d. The individual connector (1 black/yellow).

TAILLIGHT (DR250 AND DR350)



1. Screw
2. Lens
3. Bracket
4. Base
5. Bulb
6. Gasket
7. Collar
8. Rubber cushion
9. Washer
10. Nut

89



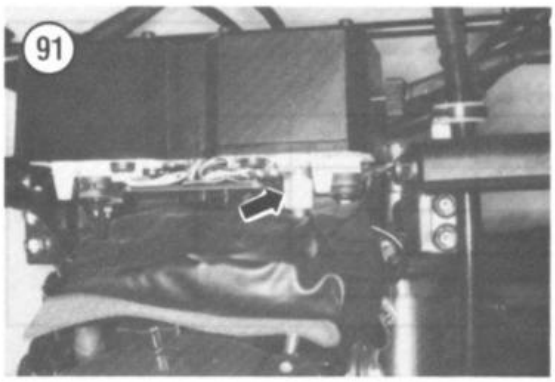
6. Remove the 3 flange nuts (**Figure 93**) securing the meter housing to the mounting bracket and remove it.

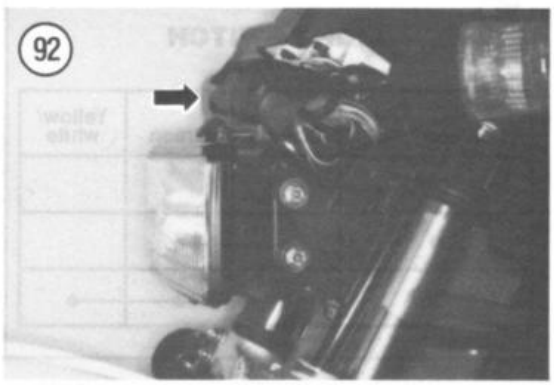
7. To remove the mounting bracket, remove the nuts, lockwasher and washers securing the mounting bracket to the upper fork bridge and remove it.

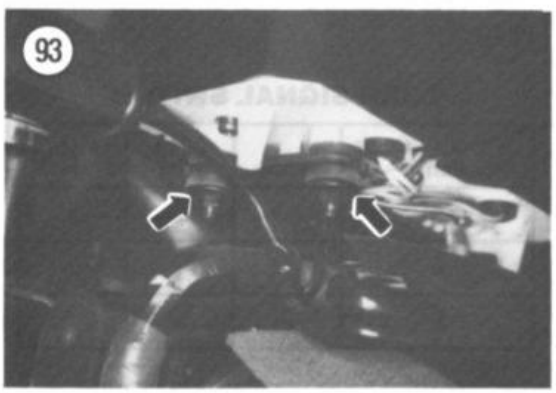
8. Install by reversing these removal steps while noting the following:

a. Make sure the electrical connectors are free of corrosion and are tight.

b. Tighten all nuts securely.







Trip Meter Housing and Bracket (DR250 and DR350) Removal/Installation

1. Remove the lower screw and washer securing the lower portion of the headlight fairing.

2. Carefully pull up on the headlight fairing and unhook the single rubber strap securing the fairing at the top and remove the headlight fairing.

3. Disconnect the trip meter cable at the base of the meter housing.

4. Remove the nuts and washers securing the trip meter and remove the meter from the mounting bracket.

5. If necessary, remove the bolts securing the mounting bracket and remove it from the upper fork bridge. Don't lose the metal collar in each rubber cushion on the mounting bracket.

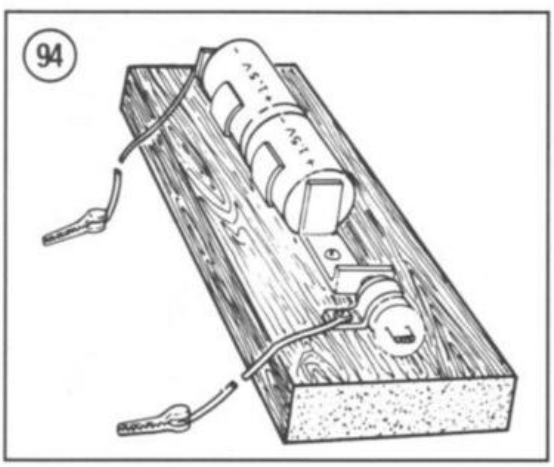
6. Install by reversing these removal steps.

SWITCHES

Switches can be tested with an ohmmeter that is described in Chapter One or with a homemade test light (**Figure 94**). To test a switch, disconnect the electrical connector for that specific switch. The following figures show the continuity diagram for each specific switch and indicates which terminals should show continuity when the switch is in a given position.

If you suspect a faulty switch, perform the following test.

1. Disconnect the switch electrical connector from the main wiring harness.



2. Refer to the following illustrations:
   a. **Figure 95**: Main ignition switch.
   b. **Figure 96**: Engine stop switch.
   c. **Figure 97**: Headlight dimmer switch.
   d. **Figure 98**: Light switch (U.S. & Canada).
   e. **Figure 99**: Light switch (U.K.).
   f. **Figure 100**: Turn signal switch.
   g. **Figure 101**: Neutral indicator switch.
   h. **Figure 102**: Sidestand switch.
   i. **Figure 103**: Front brake switch.
   j. **Figure 104**: Rear brake switch.
   k. **Figure 105**: Horn switch.

3. To check continuity of the switch, use an ohmmeter and perform the following:
   a. Connect the ohmmeter test leads to the indicated color wires in the switch side of the electrical connector and check for continuity (indicated resistance) in all switch positions.
   b. Also check for continuity (indicated resistance) of all related electrical wires.
   c. If the switch fails any portion of this test, replace the switch as described in this chapter.

(95)

MAIN IGNITION SWITCH

Position \ Color	Black/ yellow	Black/ white	Red	Orange	Green	Brown
Off	•	•				
On			•	•	•	•
P	•	•	•			•

(96)

ENGINE STOP SWITCH

Position \ Color	Black/ yellow	Black/ white
Off	•	•
Run		

(97)

HEADLIGHT DIMMER SWITCH

Position \ Color	White	Yellow	Yellow/ white
Hi		•	•
Low	•		•

(98)

LIGHT SWITCH (U.S. AND CANADA)

Position \ Color	Orange	Green	Yellow/ white
On	•	•	•

(99)

LIGHT SWITCH (U.K.)

Position \ Color	Orange	Green	Yellow/ white
Off			
•	•	•	
On	•	•	•

(100)

TURN SIGNAL SWITCH

Position \ Color	Black	Light blue	Light green
R		•	•
•			
L	•	•	

(101)

NEUTRAL INDICATOR SWITCH

Color / Position	Blue	Ground
On (Neutral position)	•	•
Off		

(102)

SIDESTAND SWITCH

Color / Position	Green	Black/ white
On (Upright position)	•	•
Off (Down position)		

(103)

FRONT BRAKE SWITCH

Color / Position	Terminal	Terminal
On (Squeeze lever)	•	•
Off		

(104)

REAR BRAKE SWITCH

Color / Position	Orange	White/ black
On (Depress pedal)	•	•
Off		

(105)

HORN SWITCH

Color / Position	Black/ blue	Black/ white
On (Push)	•	•
Off		

4. When testing switches, perform the following:
   a. First check to make sure the fuse is good as described in this chapter. Replace if necessary.
   b. Check the battery as described under *Battery* in Chapter Three. Bring the battery to the correct state of charge, if required.

CAUTION

Do not attempt to start the engine with the battery negative cable disconnected or you will damage the wiring harness and related solid state components within the electrical systems.

   c. When replacing handlebar switch assemblies, make sure the cables are routed correctly so that they are not crimped when the handlebar is turned from side to side.
   d. When separating 2 connectors, pull on the connector housings and not the wires.
   e. After locating a defective circuit, check the connectors to make sure they are clean and properly connected. Check all wires going into a connector housing to make sure each wire is properly positioned and that the wire end is not loose.
   f. To properly connect connectors, push them together until they click into place.

9

Left Handlebar Switch Replacement (DR250S and DR350S)

1. The left handlebar switch housing is equipped with the following switches:
   a. Dimmer switch.
   b. Turn switch.
   c. Horn button switch.
2. Remove the lower screw and collar (A, **Figure 75**) securing the lower portion of the headlight fairing.
3. Remove the side screw and collar (B, **Figure 75**) on each side securing the headlight fairing on each side and remove the headlight fairing (C, **Figure 75**).
4. Open the electrical harness connector cover (**Figure 92**).
5. Follow the electrical harness from the left switch and locate the 6-pin electrical connector containing 6 wires (1 yellow, 1 black/blue, 1 black/white, 1 light green, 1 light blue and 1 black). Also disconnect the 1 individual connector (1 yellow/white) from the main harness.
6. Disconnect all switch electrical connectors.

7. Remove the screws holding the switch assembly together (A, **Figure 106**).
8. Remove the tie wraps (B, **Figure 106**) from the handlebar and remove the switch and wiring harness assembly.
9. Install by reversing these removal steps while noting the following:
   a. Make sure the electrical connectors are free of corrosion and are tight.
   b. Be sure to secure the switch wiring harness to the handlebar with tie wraps.

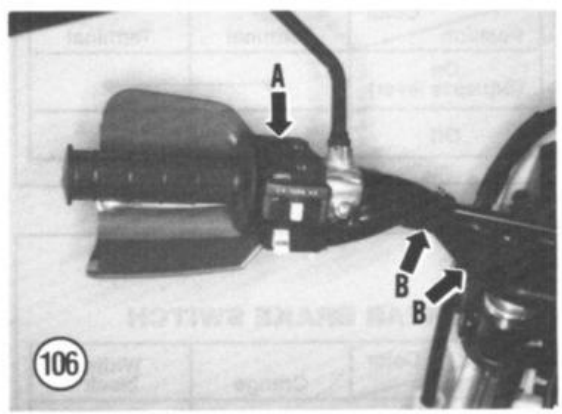
Right Handlebar Switch Replacement (DR250S and DR350S)

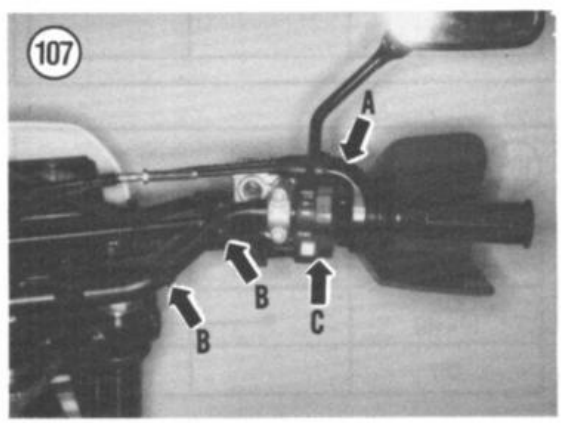
1. The right handlebar switch housing is equipped with the following switches:
   a. Engine stop switch.
   b. Starter button switch (electric start models).
   c. Light switch (U.K. models).
2. Remove the lower screw and collar (A, **Figure 75**) securing the lower portion of the headlight fairing.
3. Remove the side screw and collar (B, **Figure 75**) on each side securing the headlight fairing on each side, then remove the headlight fairing (C, **Figure 75**).
4. Open the electrical harness connector cover (**Figure 92**).
5. Follow the electrical harness from the right switch and locate the 4-pin electrical connector containing 4 wires (1 black/blue, 1 orange, 1 green and 1 white/black). Also disconnect the 2 individual connectors (1 black/yellow and 1 yellow/white) from the main harness.
6. Disconnect all switch electrical connectors.
7. Remove the screws holding the throttle case assembly together.
8. Disconnect the throttle cables (A, **Figure 107**) from the throttle case and throttle grip. Remove the throttle case and throttle grip assemblies.
9. Remove the tie wraps (B, **Figure 107**) from the handlebar.
10. Remove the screws holding the switch assembly together (C, **Figure 107**).
11. Remove the screw securing the right switch together and slide the switch assembly off the end of the handlebar. Remove the switch and wiring harness assembly.
12. Install by reversing these removal steps while noting the following:
    a. Make sure the electrical connectors are free of corrosion and are tight.
    b. Be sure to secure the switch wiring harness to the handlebar with tie wraps.
    c. Adjust the throttle cables as described under *Throttle Cable Adjustment* in Chapter Three.

Engine Kill Switch (DR250 and DR350)

NOTE
The DR250 and DR350 models are equipped with just one switch, the engine kill switch.

1. Remove the lower screw and washer securing the lower portion of the headlight fairing.
2. Carefully pull up on the headlight fairing and unhook the single rubber strap securing the fairing at the top and remove the headlight fairing.
3. Follow the electrical harness from the kill switch to the area under the trip meter and locate the 2





individual connectors (1 black/white and 1 black/yellow) from the main harness.

4. Disconnect both switch electrical connectors.

5. Remove the tie wraps from the handlebar.

6. Remove the clamp screw holding the switch assembly to the handlebar.

7. Remove the switch and wiring harness assembly.

8. Install by reversing these removal steps while noting the following:

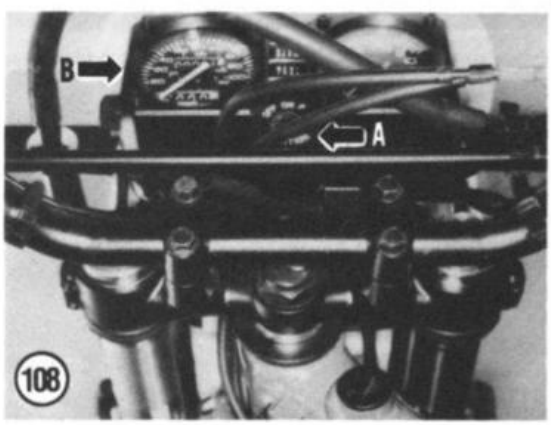
a. Make sure the electrical connectors are free of corrosion and are tight.

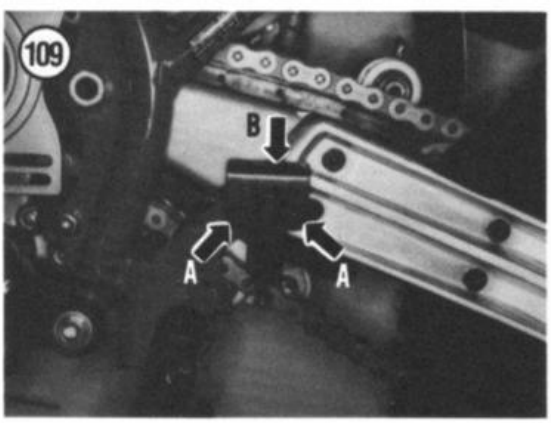
b. Be sure to secure the switch wiring harness to the handlebar with tie wraps.

Ignition Switch Replacement (DR250S and DR350S)

The ignition switch (A, **Figure 108**) is attached to the speedometer and tachometer housing.

1. Remove the speedometer and tachometer housing (B, **Figure 108**) as described in this chapter.





2. Follow the electrical harness from the ignition switch and locate the 6-pin electrical connector containing 5 wires (1 black/blue, 1 red, 1 orange, 1 green and 1 brown). Also disconnect the individual connector (1 black/yellow) from the main harness.

3. Disconnect all ignition switch electrical connectors.

4. Remove the fasteners securing the ignition switch to the meter housing. Remove the ignition switch.

5. Install by reversing these removal steps. Make sure the electrical connectors are free of corrosion and are tight.

Sidestand Switch Replacement (DR250S and DR350S)

The sidestand switch is mounted on the left-hand side of the bike above the sidestand.

1. Place wood blocks under the engine to support the bike securely.

2. Follow the electrical harness from the sidestand switch along the left-hand side of the frame across the front and up the right-hand side next to the horn. Locate the 2 individual electrical connectors (1 black/white and 1 green).

3. Disconnect the sidestand switch electrical connectors.

4. Unhook the switch's electrical wire from the clips on the frame.

5. Remove the screws (A, **Figure 109**) securing the sidestand switch (B, **Figure 109**) to the frame.

NOTE

Note the path of the electrical harness through the frame. This harness is quite long and must be reinstalled onto the same parts of the frame.

6. Remove the sidestand switch and electrical harness from the frame.

7. Install by reversing these removal steps while noting the following:

a. Make sure the electrical connectors are free of corrosion and are tight.

b. Be sure to hook the switch's electrical wire into the clips on the frame.

Neutral Switch Replacement (DR250S and DR350S)

The neutral switch (**Figure 110**) is mounted on the left-hand crankcase near the shift lever.

1. Remove the front drive sprocket as described in Chapter Eleven.
2. Follow the electrical wire from the neutral switch along the left-hand side of the engine and up the left-hand frame down tube and up to the area in front of the CDI unit.
3. Disconnect the neutral switch single black electrical connector leading to the 4-pin electrical at the CDI unit.

NOTE

The following steps are shown with the engine removed from the frame for clarity.

CAUTION

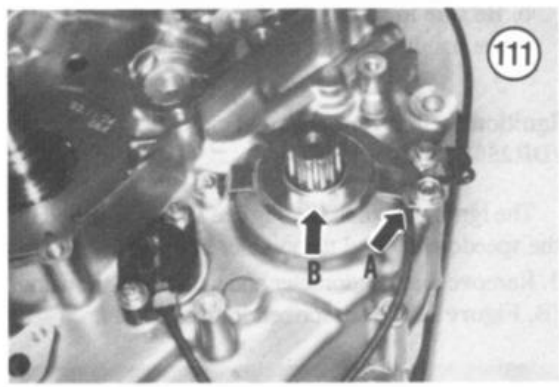
*Note that the electrical wire is positioned under the oil seal holder (A, **Figure 111**). This is necessary to keep the wire away from the sprocket and drive chain to avoid wire damage. The wire must be placed in the same location during installation.*

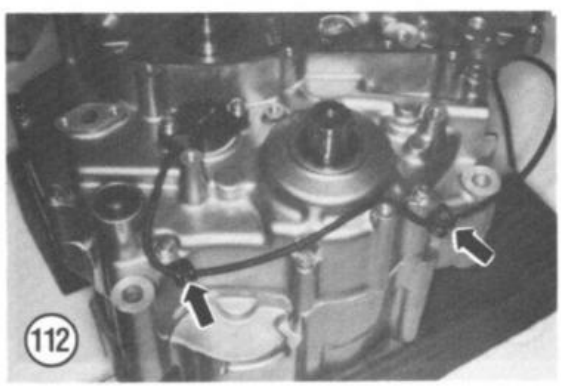
4. Remove the bolts securing the transmission mainshaft oil seal holder (B, **Figure 111**) and remove the holder.
5. Unhook the wire from the clips (**Figure 112**).
6. Place a drain pan underneath the neutral switch as some engine oil will drain out when the switch is removed.
7. Remove the screws (**Figure 113**) securing the neutral switch to the crankcase.

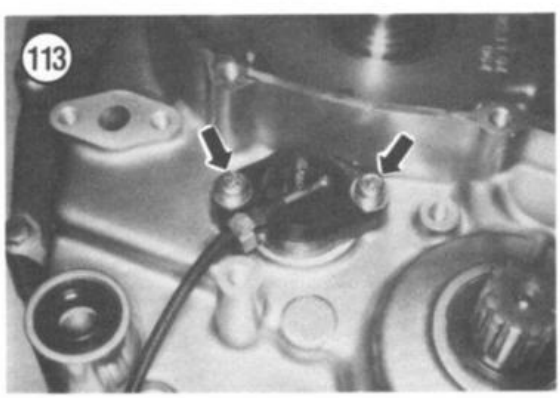
NOTE

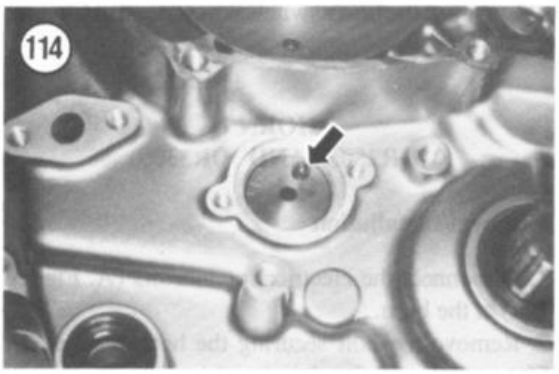
There is a small pin and spring that may fall out of the shift drum end when the neutral switch is removed. Be prepared to catch them during switch removal.

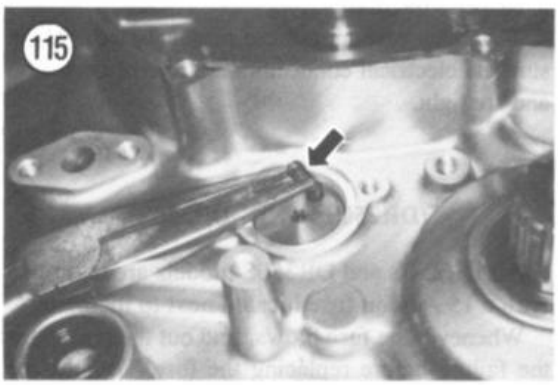
8. Remove the neutral switch and O-ring from the crankcase.
9. If the neutral switch is going to be left off for any duration, remove the small pin (**Figure 114**) and spring (**Figure 115**) from the shift drum. Place them in a small reclosable plastic bag to avoid misplacing them.

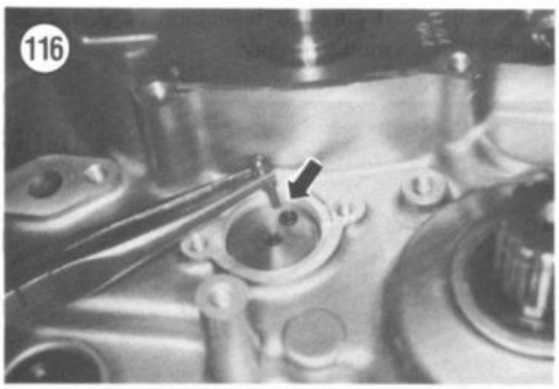


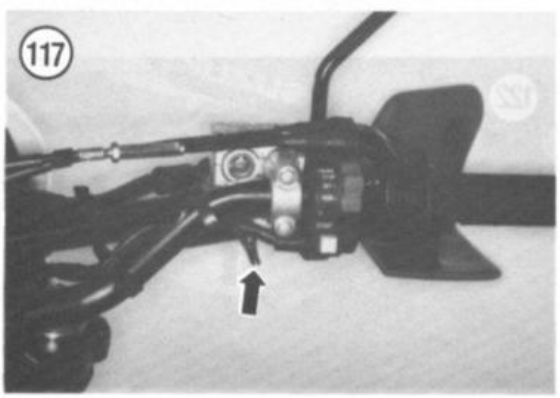












10. Install by reversing these removal steps while noting the following:

a. If removed, install the spring (**Figure 115**) and small pin in the direction shown in **Figure 116**. Push the pin all the way in.

b. Make sure the O-ring is in place on the switch prior to installation. Install the screws and tighten securely, do not overtighten as the plastic part may break.

c. Be sure to install the electrical wire *under* the oil seal holder (A, **Figure 111**). This is to keep the wire away from the sprocket and drive chain to avoid wire damage.

d. Make sure the electrical connector is free of corrosion and is tight.

e. Refill the engine oil, as required, as described in Chapter Three.

Front Brake Switch Replacement (DR250S and DR350S)

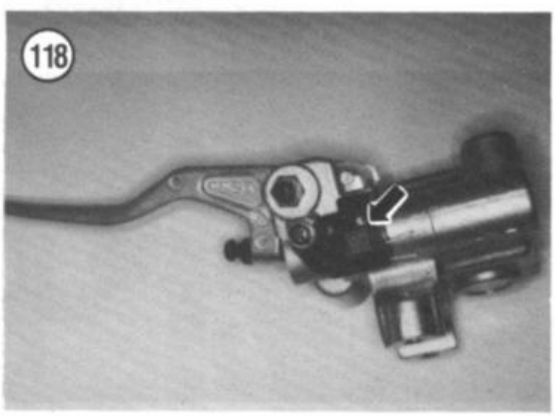
The front brake switch is mounted on the master cylinder housing.

1. Disconnect the front brake switch electrical connectors (**Figure 117**) from the switch.

NOTE

***Figure 118** is shown with the master cylinder removed from the handlebar for clarity only. It is not necessary to remove the master cylinder in order to remove the switch.*

2. Remove the screw securing the switch (**Figure 118**) to the base of the master cylinder housing and remove it.



3. Install by reversing these removal steps. Make sure the electrical connectors are free of corrosion and are tight.

Rear Brake Switch Replacement (DR250S and DR350S)

The rear brake switch is mounted on the right-hand side of the bike.

1. Remove the seat as described in Chapter Thirteen.
2. Remove both frame side covers.
3. Follow the electrical harness from the rear brake light switch along the right-hand side of the frame and across next to the CDI unit. Locate the 2-pin electrical connector containing 2 wires (1 white/black and 1 orange).
4. Disconnect the brake light switch electrical connector.
5. Disconnect the rear brake switch spring (**Figure 119**) from the brake pedal or switch.
6. Pull the switch (**Figure 120**) up and out of the frame mounting bracket and remove the switch.
7. Install by reversing these removal steps while noting the following:
   a. Make sure the electrical connector is free of corrosion and is tight.
   b. Adjust the brake switch as described in Chapter Three.

HORN (DR250S AND DR350S)

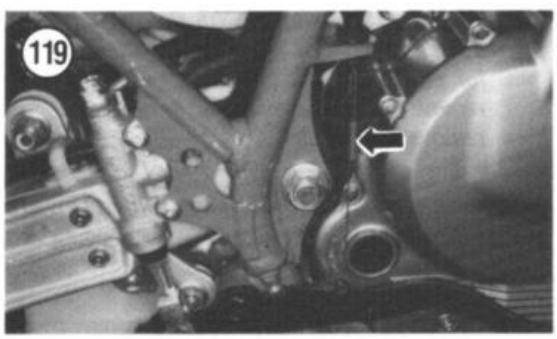
Removal/Installation

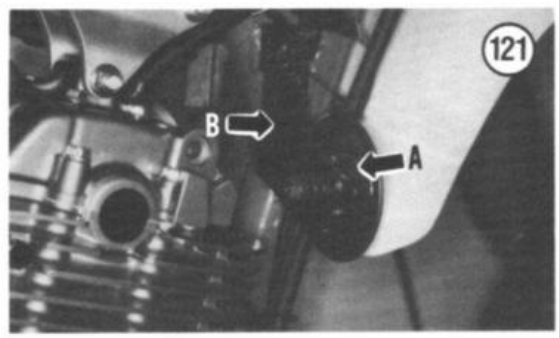
1. Disconnect the electrical connectors (A, **Figure 121**) at the horn.
2. Remove the bolt securing the horn bracket (B, **Figure 121**) and the electrical wire clamp.
3. Remove the horn.
4. Install by reversing these removal steps. Make sure the electrical connectors are free of corrosion and are tight.

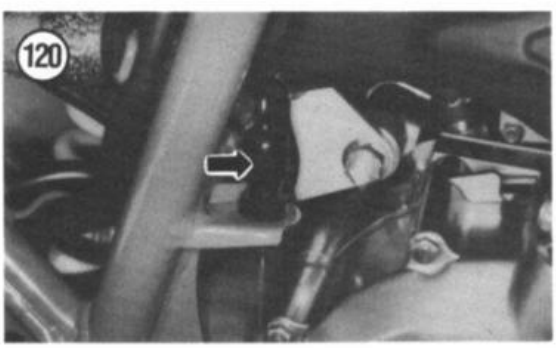
FUSE (DR250S AND DR350S)

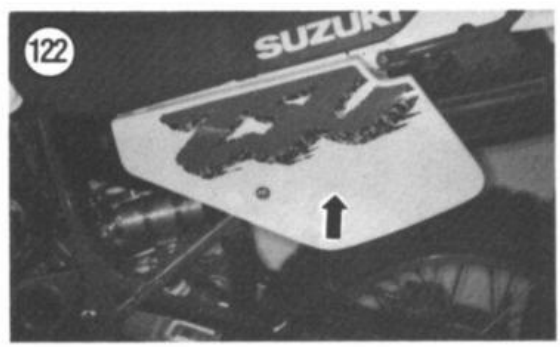
All DR250S and DR350S models are equipped with a 15 A main fuse located next to the battery.

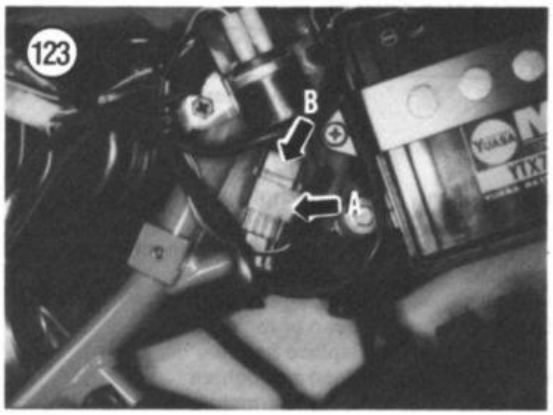
Whenever the fuse blows, find out the reason for the failure before replacing the fuse. Usually, the trouble is a short circuit in the wiring. This may be caused by worn-through insulation or a disconnected wire shorted to ground.











1. Remove the frame left-hand side cover (**Figure 122**).
2. Pull the fuse holder (A, **Figure 123**) away from the frame and remove the cover (B, **Figure 123**).

NOTE
Always carry a spare fuse in addition to the existing spare fuse within the fuse holder.

3. Remove the defective fuse and install a new one.
4. Install all parts removed.

WIRING DIAGRAMS

Wiring diagrams are located at the end of this book.

Table 1 CHARGING SYSTEM TEST SPECIFICATIONS

Item	Specification
Charging system (DR250 and DR350)	
Type	Flywheel generator
Lighting system coil resistance	0.1-0.5 ohms
Charging system (DR250S and DR350S)	
Type	Flywheel generator
Battery	
Type or model	YT4L-BS or FT4L-BS
Capacity	12 volts; 3 amp hours
Charging system output test 5,000 rpm	13.0-15.5 V DC
Generator no-load performance standard voltage	65 V (AC) at 5,000 rpm
Pickup coil resistance	
1990-1992	250-270 ohms
1993-on	350-700 ohms
Source coil resistance	
1990-1992	250-370 ohms
1993-on	350-650 ohms
Ignition coil resistance (all models)	
Primary resistance	0.1-1.0 ohms
Secondary resistance	12,000-22,000 ohms
Starter solenoid resistance	3-7 ohms

* All tests should be made with component at a temperature of 68° F (20° C).

Table 2 TIGHTENING TORQUES

Item	N•m	ft.-lb.
Alternator rotor nut	120-140	87-101.5
External oil line union bolts	8-12	6-8.5
Cam chain tensioner bolt	7-9	5-6.5

Table 3 STARTER TROUBLESHOOTING

Symptom	Probable cause	Remedy
Starter does not work	Low battery	Recharge battery
	Worn brushes	Replace brushes
	Defective relay	Repair or replace
	Defective switch	Repair or replace
	Defective wiring or connection	Repair wire or clean connection
	Internal short circuit	Repair or replace defective component
Starter action is weak	Low battery	Recharge battery
	Pitted relay contacts	Clean or replace
	Worn brushes	Replace brushes
	Defective connection	Clean and tighten
	Short circuit in commutator	Replace armature
Starter runs continuously	Stuck relay	Replace relay
Starter turns; does not turn engine	Defective starter clutch	Replace starter clutch

Table 4 REPLACEMENT BULBS

Item	DR250S and DR350S	DR250 and DR350
Headlight	60W/55W (12V)	55W (12V)
Taillight	—	5W (12V)
Taillight/brake light	21W/5W (12V)	—
Flasher light	21W (12V)	—
License plate light	5W (12V)	—
Position light (U.K. only)	3.4 W (12V)	—
Meter lights	1.7W (12V)	—

CHAPTER TEN

FRONT SUSPENSION AND STEERING

This chapter describes repair and maintenance on the front wheel, forks and steering components.

One U.K. version of the DR350S is equipped with an optional Suzuki Height Control (SHC) system. This system consists of a special hydraulic system that interconnects the front forks and rear shock and can raise the bike to two different heights. The front fork and related hoses are completely different than the fork assembly used on all other models covered in this manual. The SHC system is *not* covered in this manual. Consult your local dealer for SHC system service.

Front suspension specifications are listed in **Table 1**. Tightening torques are listed in **Table 2**. **Tables 1-2** are at the end of the chapter.

FRONT WHEEL

Removal

CAUTION

Care must be taken when removing, handling and installing a wheel with a disc brake rotor. The disc rotor is relatively thin in order to dissipate heat and to minimize unsprung weight. The rotor is designed to withstand tremendous rotational loads but can be damaged when subjected to side impact loads. If the rotor is knocked out of true by a side impact a pulsation will be felt in the front brake lever when braking. The rotor is too thin to be trued and must be replaced with a new one. Protect the rotor when transporting a wheel to a dealer or tire specialist for tire service. Do ***not*** *place a wheel in a car trunk or pickup bed without protecting the rotor from side impact damage.*

NOTE

The front wheel can be removed with the brake caliper still attached to the front fork slider.

1. Remove the screw securing the speedometer, or trip meter, cable collar (A, **Figure 1**) and remove the cable (B, **Figure 1**) from the meter drive unit on the front wheel.

2. Loosen the nuts securing the front axle holder (C, **Figure 1**).

3. Unscrew the front axle (D, **Figure 1**) from the left-hand fork slider.
4. Support the motorcycle with the front wheel off the ground.
5. Slide the front axle out from the right-hand side. Don't loose the collar on the left-hand side of the hub.
6. Pull the wheel forward and remove it.

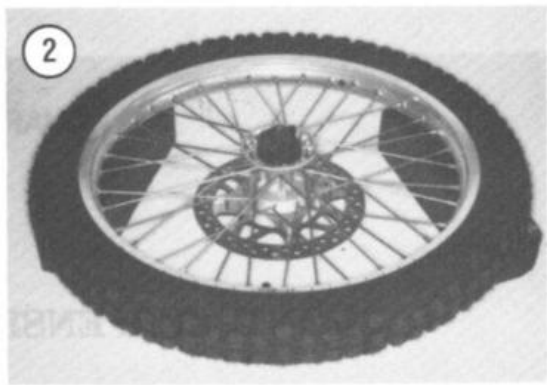
NOTE

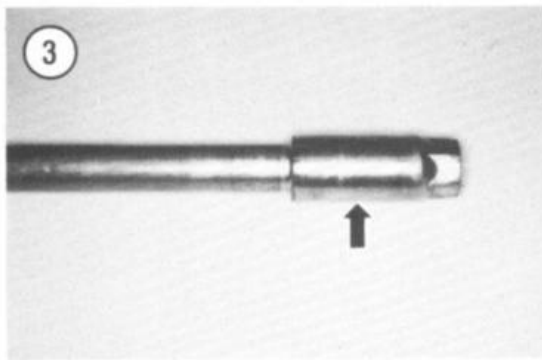
After removing the front wheel in Step 7, insert a piece of wood or hose in the caliper between the brake pads. That way, if the brake lever is accidentally squeezed, the piston will not be forced out of the brake caliper cylinder. If the brake lever is squeezed and the piston comes out, the caliper might have to be disassembled to reseat the piston and the system will have to be bled.

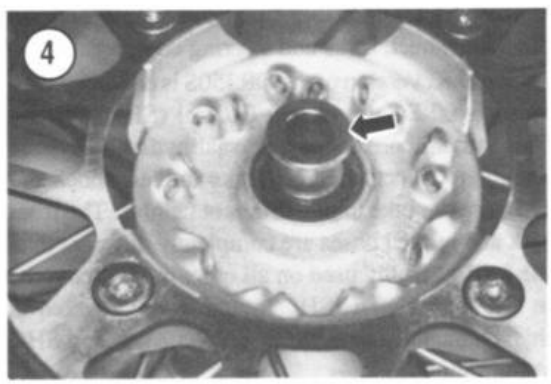
CAUTION

Do not set the wheel down on the disc surface as it may get scratched or warped. Set the tire sidewalls on 2 wood blocks as shown in ***Figure 2****.*

7. Inspect the wheel spokes and hub as described in this chapter.

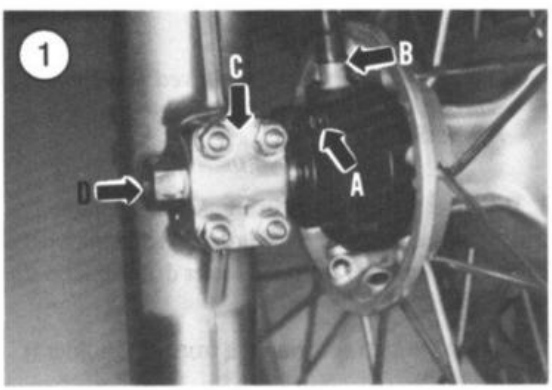


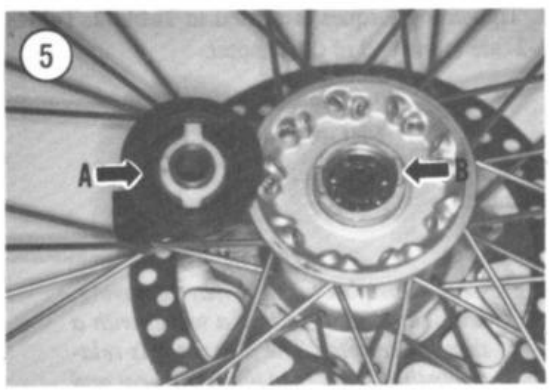


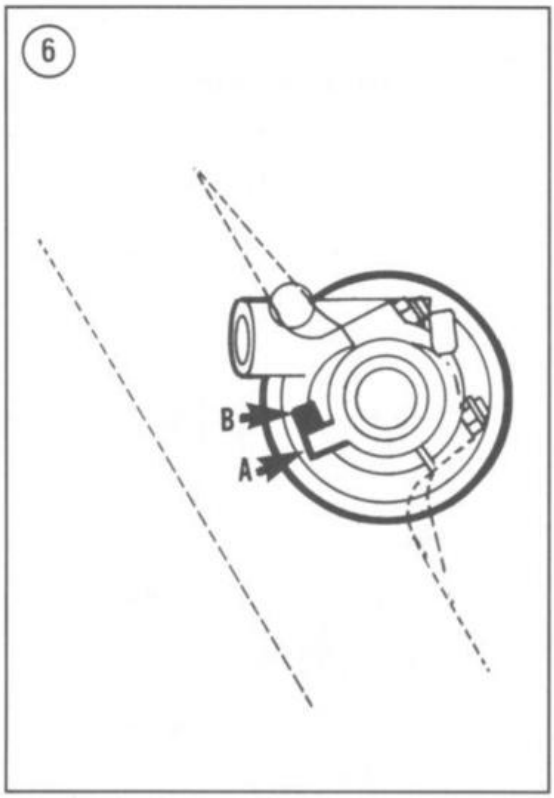


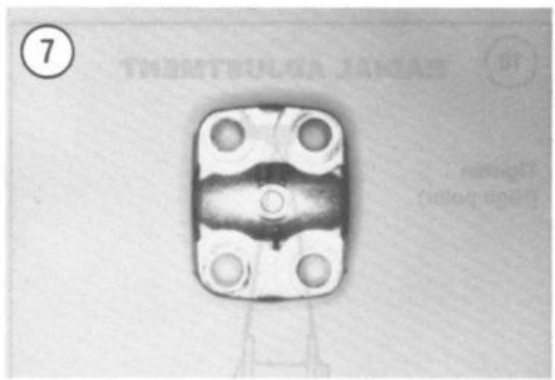
Installation

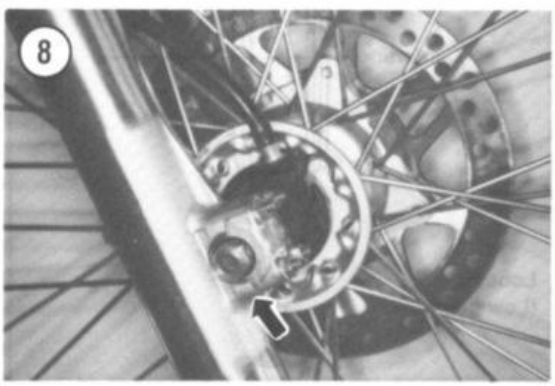
1. Clean the axle and axle spacer in solvent and thoroughly dry. Make sure all axle contact surfaces (**Figure 3**) are clean and free of dirt and old grease prior to installation. If these surfaces are not cleaned, the axle may be difficult to install.
2. Apply a light coat of grease to the axle and to the front hub bearings and grease seals.











3. Make sure the collar is installed on the left-hand side of the hub (**Figure 4**).

4. When installing the meter housing, align the drive dogs in the meter housing (A, **Figure 5**) with the raised tabs (B, **Figure 5**) in the front hub. Push the housing down until it's completely seated.

5. Remove the piece of wood or hose from the caliper.

6. Correctly position the front wheel between the front forks and carefully insert the disc between the brake pads and install the wheel. Don't damage the leading edges of the brake pads.

7. Make sure to position the stopper (A, **Figure 6**) on the speedometer drive unit below the raised boss (B, **Figure 6**) on the right-hand fork tube.

8. Install the axle (D, **Figure 1**) from the right-hand side and tighten to the torque specification in **Table 2**.

9. If the front axle holder was removed, install it as follows:

   a. Install the front axle holder with the UP arrow (**Figure 7**) facing up.

   b. Install the nuts only finger-tight at this time.

10. Rotate the front wheel and apply the brake. Do this a couple of times to make sure the front wheel and brake are operating correctly.

11. Slowly rotate the front wheel while inserting the meter cable into the meter housing. Install the screw securing the cable collar onto the housing and tighten securely.

12. Remove the wood block(s) from under the engine.

13. Sit on the seat, apply the front brake and push down on the handlebars several times. This will center the front axle within the front forks.

14. Place the bike back on the sidestand.

WARNING

In the following step, the front axle holder nuts must be tightened in the specific manner and to the specified torque value. After installation there must be a slight gap at the bottom, with ***no gap*** *at the top. If done incorrectly, the studs may fail, resulting in the loss of control of the bike when riding.*

15. Tighten the front axle holder nuts to the torque specification in **Table 2**. Tighten the upper nuts first, then the lower nuts. There must be a gap (**Figure 8**) at the lower portion of the front axle holder.

WHEEL SPOKE SERVICE

Spoke Inspection

Spokes loosen with use and should be checked periodically. The "tuning fork" method for checking spoke tightness is simple and works well. Tap each spoke with a spoke wrench or the shank of a screwdriver and listen for a tone. A tightened spoke will emit a clear, ringing tone and a loose spoke will sound flat. All the spokes in a correctly tightened wheel will emit tones of similar pitch but not necessarily the same precise tone.

Bent, stripped or broken spokes should be replaced as soon as they are detected, as they can cause the destruction of an expensive hub.

NOTE

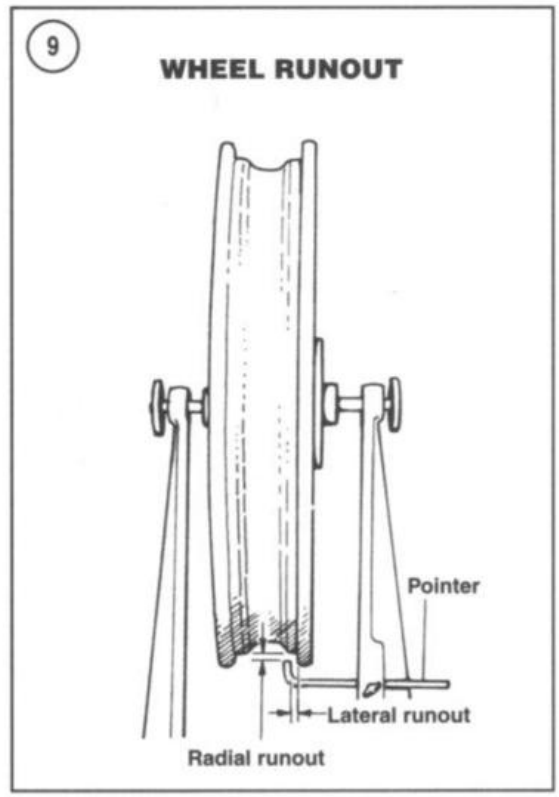
If you are riding and one or more of the spokes should break, tie the broken spoke(s) to an adjacent spoke with wire, tape or string until you can ride home and replace it. This will prevent the broken spoke from dangling loose and eventually damaging the fork tubes or the rear sprocket.

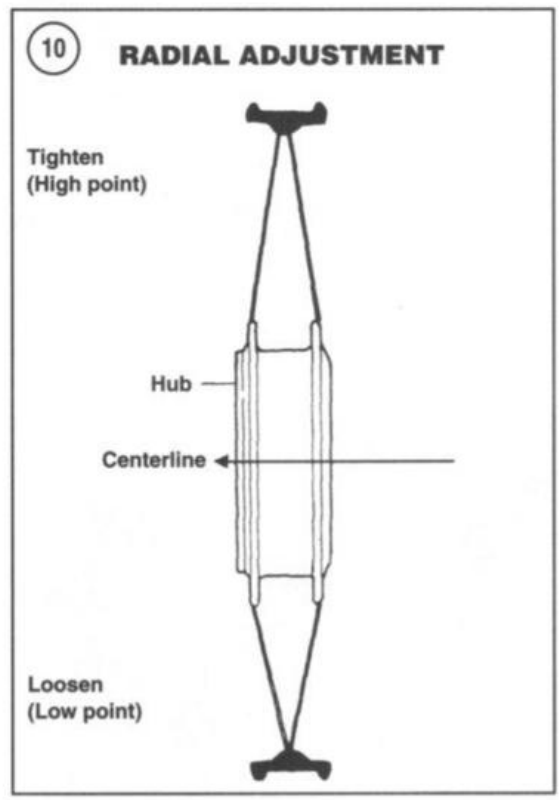
Spoke Replacement

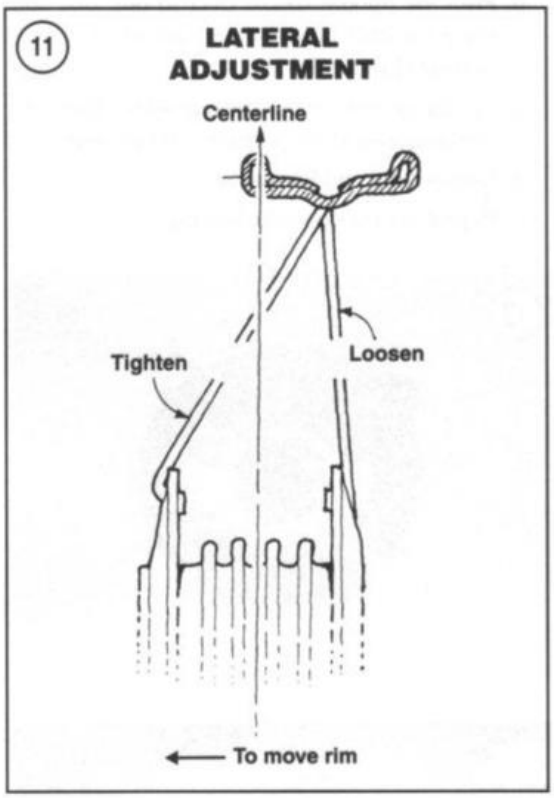
1. Unscrew the nipple from the spoke and depress the nipple into the rim far enough to free the end of the spoke, taking care not to push the nipple all the way in.
2. Remove the damaged spoke from the hub and use it to match a new spoke of identical length. If necessary, trim the new spoke to match the original and dress the end of the thread with a thread die.
3. Install the new spoke in the rim and hub and screw on the nipple; tighten it until the spokes' tone is similar to the tone of the other spokes in the wheel.
4. Periodically check the new spoke; it will stretch and must be retightened several times before it takes its final set.

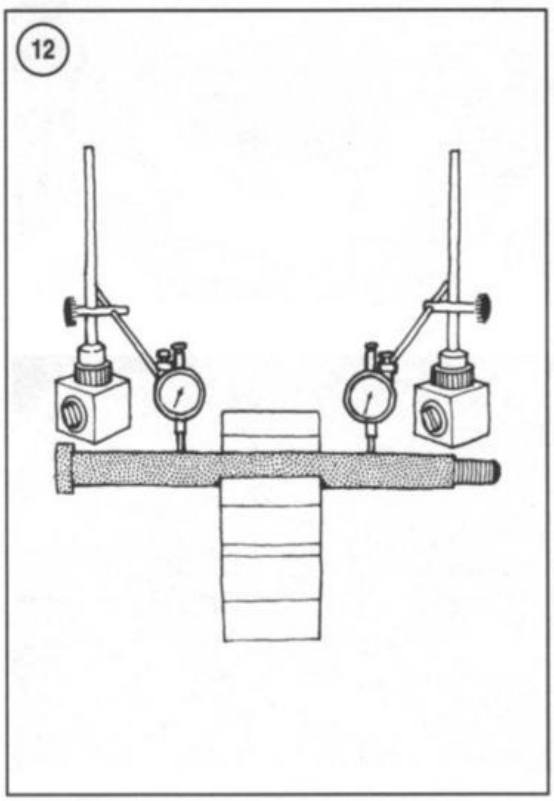
Wheel Runout

Wheel rim runout is the amount of "wobble" a wheel shows as it rotates. You can check runout with the wheels on the bike by simply supporting the wheel off the ground and turning the wheel









slowly while you hold a pointer solidly against a fork leg.

Off the motorcycle, runout can be checked with the wheel installed on a truing stand (**Figure 9**).

NOTE

A discarded rear swing arm mounted in a vise makes an ideal wheel truing stand.

The maximum allowable lateral (side-to-side) and radial (up and down) runout is listed in **Table 1**. Tighten or replace any bent or loose spokes. Always use the correct size spoke wrench or you may damage the spoke nipple.

Spoke Adjustment

1. If the radial runout is excessive, draw the high point of the rim toward the centerline of the wheel by tightening the spokes in the area of the high point and loosening the spokes on the side opposite the high point. See **Figure 10**.
2. Rotate the wheel and check runout. Continue adjusting until the runout is within specification. Be patient and thorough, adjusting the position of the rim a little at a time. If you loosen 2 spokes at the high point 1/2 turn, loosen the adjacent spokes 1/2 turn. Tight the spokes on the opposite side in equivalent amounts.
3. Adjust the lateral runout as shown in **Figure 11**.

FRONT HUB

Inspection

1. Visually check the front axle surface for cracks, deep scoring or excessive wear. Check axle runout with a set of V-blocks and dial indicator (**Figure 12**). The maximum allowable bend is listed in **Table 1**. If you do not have access to the special tools, roll the axle on a flat surface (e.g. piece of thick plage glass) and visually check the runout. Replace a bent axle. Do not attempt to straighten it–replace it.
2. Check the meter drive assembly for damage. Inspect the oil seal (A,**Figure 13**) for wear or damage. Make sure the drive dogs (B, **Figure 13**) rotate freely. If either are worn or damaged, replace the meter drive assembly.
3. Check the oil seal (A, **Figure 14**) for signs of wear, cracks or other damage. A damaged oil seal will allow bearing contamination. Replace the oil seal as described in this section.

4. Turn the inner bearing race (B, **Figure 14**) by hand and check for any sign of roughness or damage. Replace the bearings (as a set) as described in this section.
5. Check the front brake disc bolts (A, **Figure 15**) for tightness. If loose, tighten the bolts securely.
6. Check the brake disc surface (B, **Figure 15**) for oil residue. Clean with lacquer thinner before reinstalling the front wheel.

Inspection/Disassembly

Refer to **Figure 16** for this procedure.

CAUTION

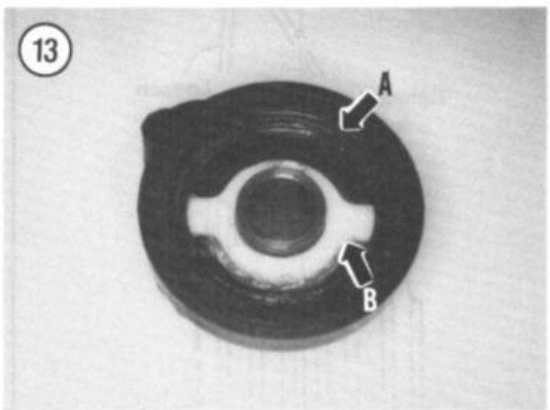
Do not remove the wheel bearings for inspection purposes as they will be damaged during the removal process. Remove wheel bearings only if they are to be replaced.

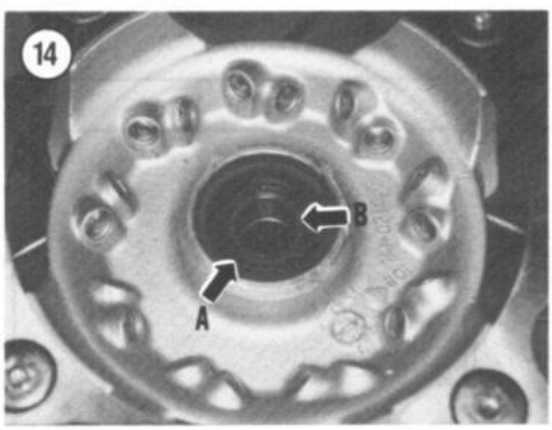
1. Remove the front wheel as described in this chapter.
2. Remove the meter drive unit (**Figure 17**) from the right-hand side of the wheel.
3. Remove the collar (**Figure 4**) from the left-hand side of the wheel.
4. On the left-hand side, remove the oil seal (A, **Figure 14**) by carefully prying it out of the left-hand side of the hub with a long flat-bladed screwdriver. Lift the screwdriver and work it around the seal every few degrees until it pops out of the hub. Prop a piece of wood or rag underneath the screwdriver to prevent damaging the hub.

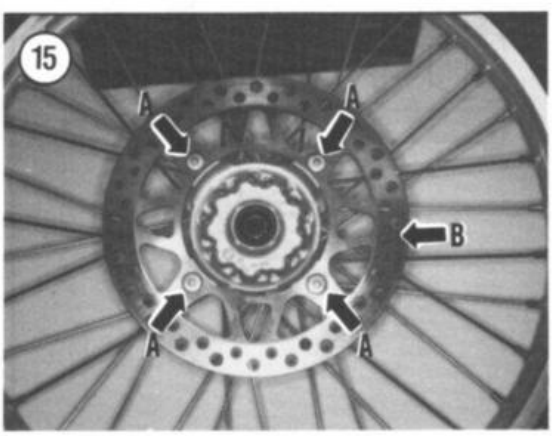
NOTE

When replacing the bearings, be sure to take your old bearings along to ensure a perfect matchup.

5. Turn the inner race (**Figure 18**) of each bearing by hand. Make sure bearings turn smoothly and check for any signs of roughness or damage. Replace the bearings as a complete set if they are noisy or have excessive play.
6. On non-sealed bearings, check the rollers or balls for evidence of wear, pitting or excessive heat (bluish tint). Replace the bearings if necessary.
7. To remove the left- (**Figure 19**) and right-hand bearings and spacer, perform the following:
   a. Insert a soft aluminum or brass drift into one side of the hub.
   b. Push the middle spacer over to one side and place the drift on the inner race of the lower bearing (**Figure 20**).
   c. Tap the bearing out of the hub with a hammer, working around the perimeter of the inner race.
   d. Remove the middle spacer.
   e. Repeat for the opposite bearing.







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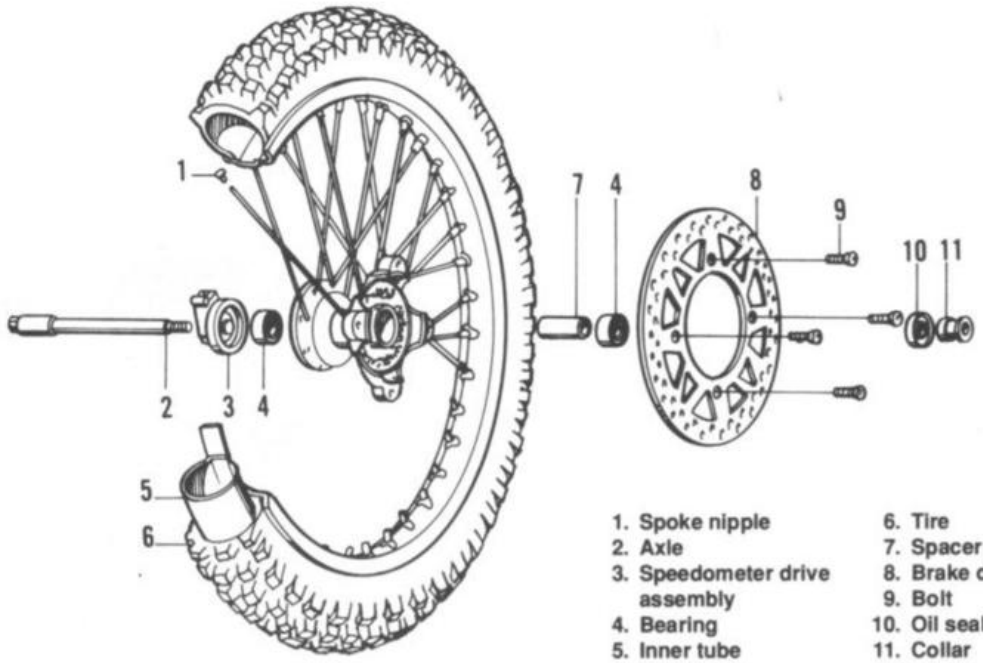
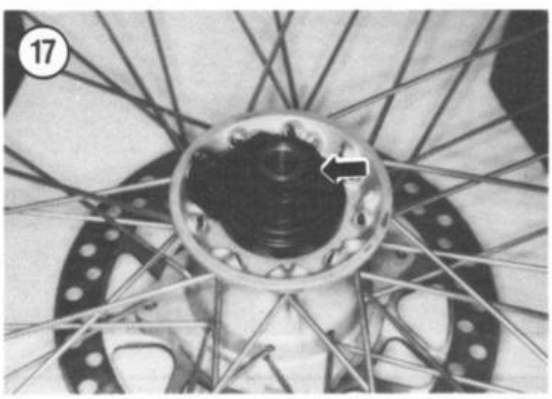
FRONT WHEEL



1. Spoke nipple
2. Axle
3. Speedometer drive assembly
4. Bearing
5. Inner tube
6. Tire
7. Spacer
8. Brake disc
9. Bolt
10. Oil seal
11. Collar

17



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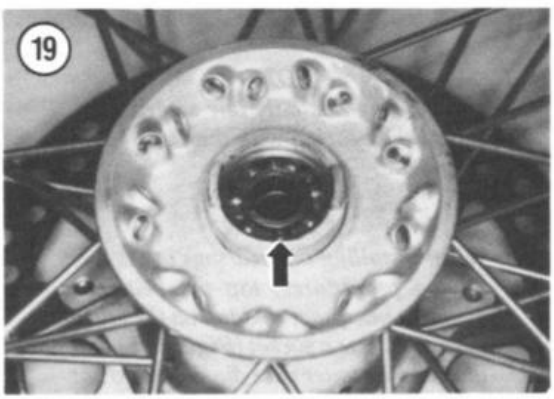

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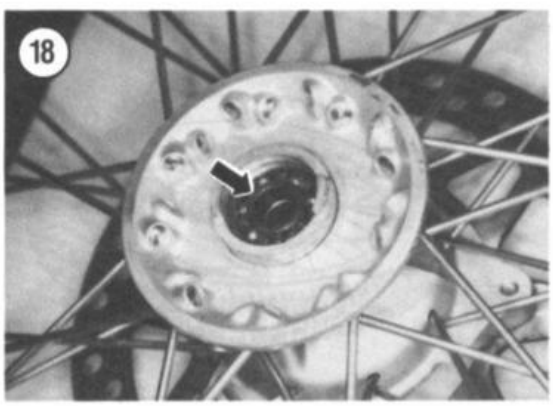

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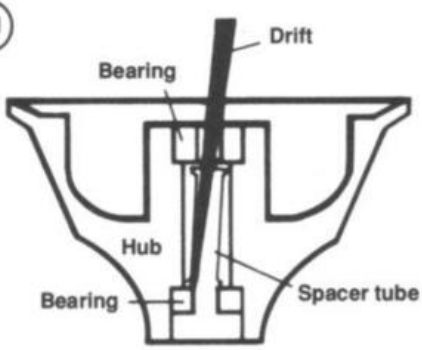


8. Thoroughly clean out the inside of the hub with solvent and dry with compressed air or a shop cloth.

Assembly

1. Blow any dirt or foreign matter out of the hub prior to installing the bearings.

NOTE

Fully sealed bearings are available from many good bearing specialty shops. Fully sealed bearings provide better protection from dirt and moisture that may get into the hub.

2. Pack non-sealed bearings with good-quality bearing grease. Work the grease in between the balls thoroughly. Turn the bearing by hand a couple of times to make sure the grease is distributed evenly inside the bearing.

3. Place the new wheel bearing outer races in a freezer if possible. Chilling them will slightly reduce their overall diameter. This will make installation easier.

4. Pack the wheel hub and middle spacer with multipurpose grease.

NOTE

If a bearing has only one sealed side, install the bearing with the sealed side facing out.

CAUTION

*When installing the bearings in the following procedures, tap the bearings squarely into place and tap on the outer race only. Use a socket (**Figure 21**) that matches the outer race diameter. Do not tap on the inner race or the bearing will be damaged. Be sure that the bearings are completely seated.*

5. Install one of the bearings. It doesn't matter which bearing is installed first.

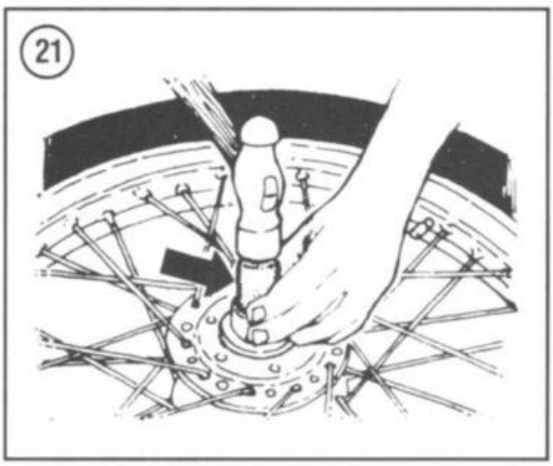
6. Install the spacer, then install the opposite bearing.

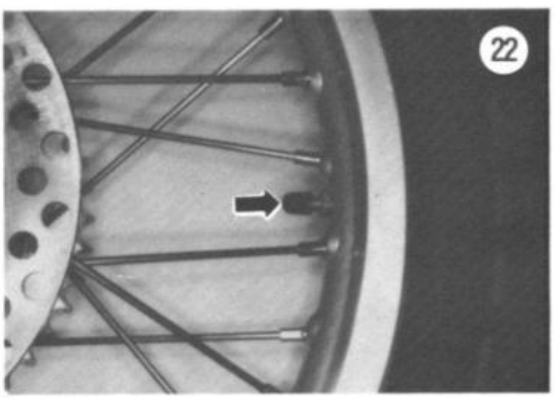
7. Lubricate the new oil seal with multipurpose grease and tap it squarely into the hub with a suitable size socket placed on the outside portion of the seal. Install the oil seal (A, **Figure 14**) until it is at least flush with the hub.

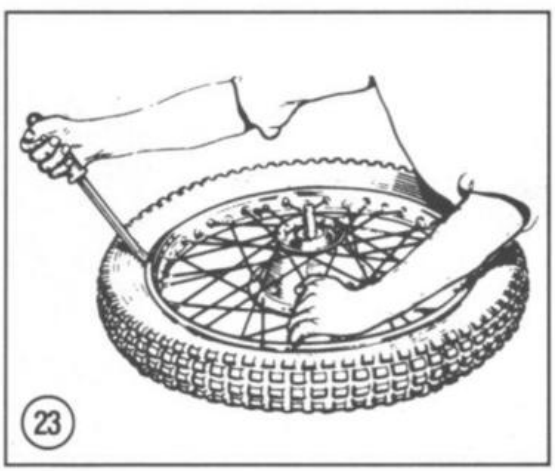
8. Install the collar (**Figure 4**) into the left-hand side of the wheel.

9. When installing the meter housing, align the drive dogs in the meter housing (A, **Figure 5**) with the raised tabs (B, **Figure 5**) in the front hub. Push the housing down until it's completely seated.

10. Install the front wheel as described in this chapter.







TIRE CHANGING

Removal

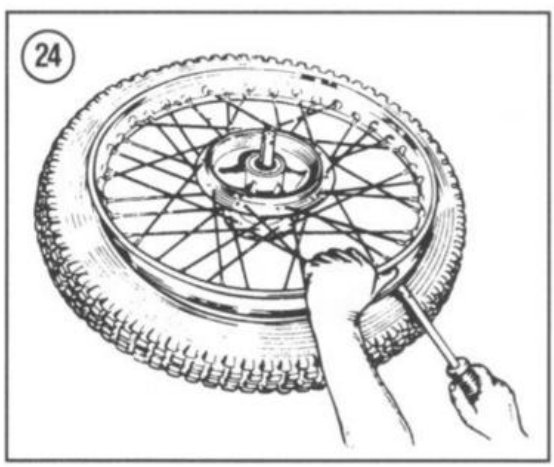
Use only quality tire irons without sharp edges. If necessary, file the ends of the tire irons to remove rough edges. Do not use screwdrivers or other sharp objects as these tools will probably puncture the tube.

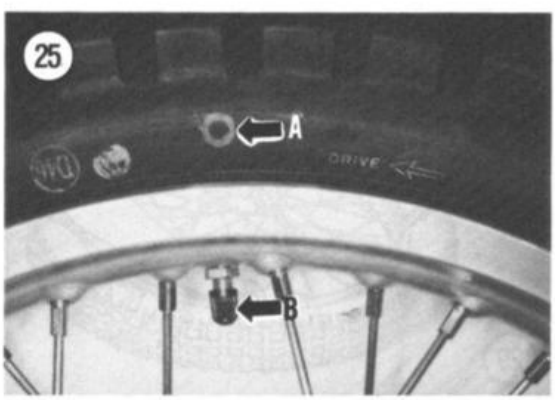
1. Remove the valve cap (**Figure 22**), nut and core and deflate the tire.
2. On models so equipped, loosen the rim lock nuts.
3. Press the entire bead on both sides of the tire into the center of the rim.
4. Lubricate the beads with soapy water.
5. Insert the tire iron under the bead next to the valve (**Figure 23**). Force the bead on the opposite side of the tire into the center of the rim and pry the bead over the rim with the tire iron.
6. Insert a second tire iron next to the first to hold the bead over the rim. Then work around the tire with the first tire iron, prying the bead over the rim. Be careful not to pinch the inner tube with the tire irons.
7. Remove the valve from the hole in the rim and remove the tube from the tire.

NOTE

Step 8 is required only if it is necessary to completely remove the tire from the rim, such as for tire replacement.

8. Stand the tire upright. Insert the tire iron between the second bead and the side of the rim that the first bead was pried over (**Figure 24**). Force the bead on the opposite side from the tire iron into the center of the rim. Pry the second bead off of the rim, working around as with the first.





Installation

1. Carefully check the tire for any damage, especially inside. On the front tire carefully check the sidewall as it is very vulnerable to damage from rocks.
2. Check that the spoke ends do not protrude through the nipples into the center of the rim to puncture the tube. File off any protruding spoke ends.

NOTE

If you are having trouble with water and dirt entering the wheel, remove and discard the rubber rim band. Then wrap the rim center with 2 separate revolutions of duct tape. Punch holes through the tape at the rim lock and valve stem mounting areas.

3. Install the rim lock if removed.
4. If you are using the rubber rim band, be sure the band is in place with the rough side toward the rim. Align the holes in the band with the holes in the rim.
5. Liberally sprinkle the inside tire casing with talcum powder. The powder reduces chafing between the tire and tube and minimizes tube pinching.

NOTE

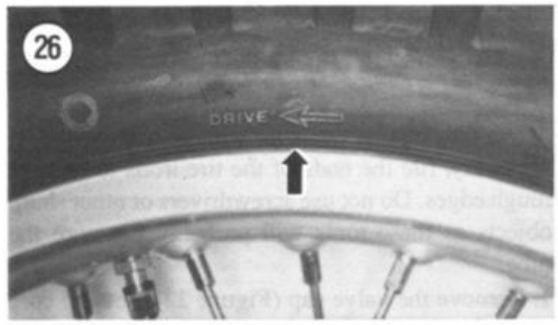
*Before installing a tire, check the sidewall for a weight identification mark. This is usually a round circle like the one shown in (A, **Figure 25**). When installing the tire align the weight mark with either the valve stem hole (B, **Figure 25**) or the rim lock hole in the rim.*

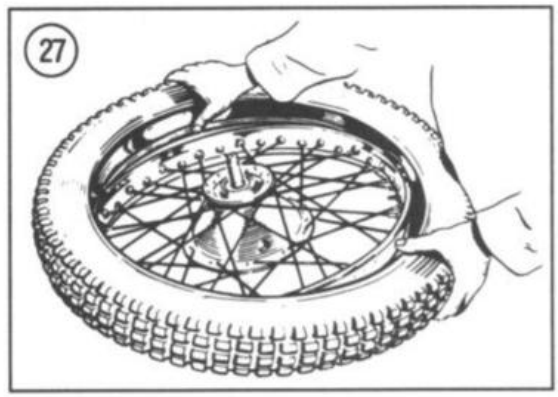
6. If the tire was removed or a new tire is being installed, perform the following:
   a. Install the tire so that it revolves in the proper direction. Some tire manufacturer's mark their tires with an arrow and "Direction" on the side wall (**Figure 26**).
   b. Lubricate one bead with soapy water.
   c. Align the tire with the rim and push the tire onto the rim (**Figure 27**). Work around the tire in both directions (**Figure 28**).
7. Install the core into the tube valve. Put the tube in the tire and insert the valve stem through the hole in the rim. Inflate just enough to round it out. Too much air will make installing it in the tire difficult, and too little will increase the chances of pinching the tube with the tire irons.
8. Lubricate the upper tire bead and rim with soapy water.
9. Press the upper bead into the rim opposite the valve. Pry the bead into the rim on both sides of the initial point with your hands and work around the rim to the valve. If the tire wants to pull up on one side, either use a tire iron or one of your knees to hold the tire in place. The last few inches are usually the toughest to install and is also where most pinched tubes occur. If you can, continue to push the tire into the rim with your hands. Re-lubricate the bead if necessary. If the tire bead wants to pull out from under the rim use both of your knees to hold the tire in place. If necessary, use a tire iron for the last few inches (**Figure 29**).
10. Wiggle the valve to be sure the tube is not trapped under the bead. Set the valve squarely in its hole before screwing on the valve nut.

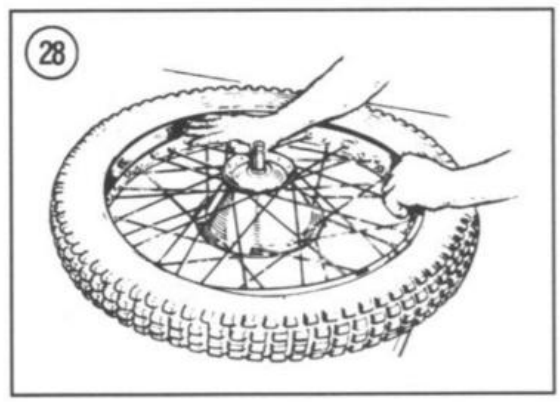
NOTE

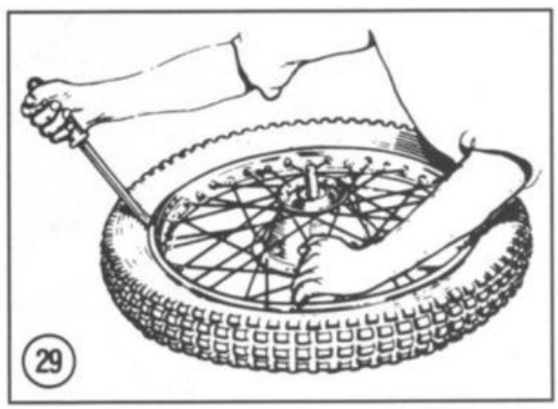
*Make sure the valve stem is not cocked in the rim as shown in (**Figure 30**).*

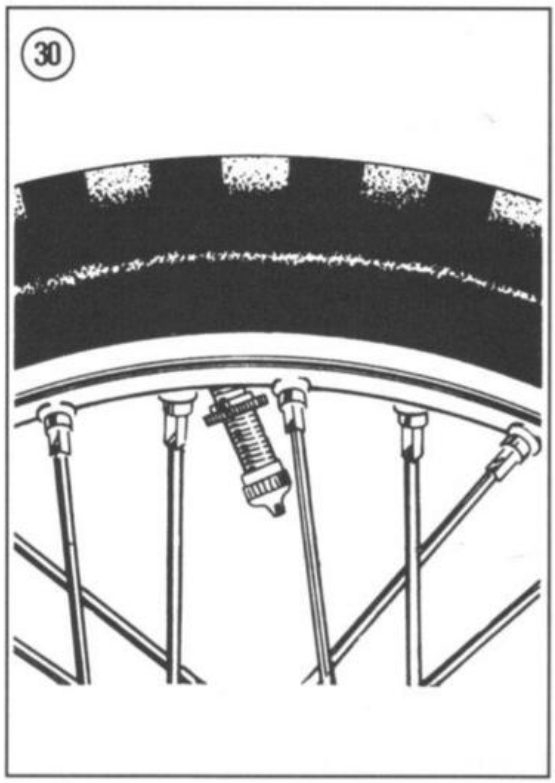
11. Check the bead on both sides of the tire for even fit around the rim. Inflate the tire to approximately 25-30 psi to insure the tire bead is seated properly on the rim. If the tire is hard to seat, re-lubricate both sides of the tire and re-inflate.
12. On models so equipped, tighten the rim lock nut securely.
13. Bleed the tire back down to between 10 and 14 psi. Never tighten the valve stem nut against the rim. It should always be installed finger-tight, near the valve stem cap rather than flush against the rim.

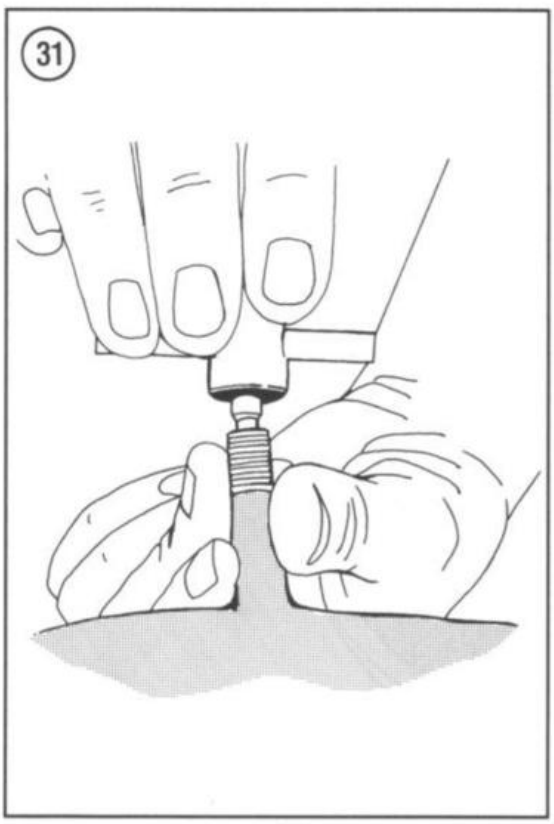












14. Inflate the tire to the recommended inflation pressure.

TIRE REPAIRS

Every rider eventually experiences trouble with a tire or tube. Repairs and replacement are fairly simple, and every rider should know how to patch a tube.

Patching a motorcycle tube is only a *temporary fix*, especially on a dual-purpose bike that is ridden a lot in the dirt. The tire flexes too much and the patch could rub right off.

NOTE

If you do a lot of off-road riding, install a stronger heavy-duty tube. This type of tube lasts longer and is not as easy to puncture.

Tire Repair Kits

Tire repair kits can be purchased from motorcycle dealers and some auto supply stores. When buying, specify that the kit you want is for motorcycles.

There are 2 types of tire repair kits:

a. Hot patch.
b. Cold patch.

Hot patches are stronger because they actually vulcanize to the tube, becoming part of it. However, they are far too bulky to carry for trail repairs, and the strength is unnecessary for a temporary repair.

Cold patches are not vulcanized to the tube; they are simply glued to it. Though not as strong as hot patches, cold patches are still very durable. Cold patch kits are less bulky than hot and more easily applied while on the road or trail. A cold patch kit contains everything necessary and tucks easily in with your emergency tool kit.

Tube Inspection

1. Remove the tube as described under *Tire Changing* in this chapter.
2. Install the valve core into the valve stem (**Figure 31**) and inflate the tube slightly. Do not overinflate.
3. Immerse the tube in water a section at a time (**Figure 32**). Look carefully for bubbles indicating a hole. Mark each hole and continue checking until you are certain that all holes are discovered and marked. Also make sure that the valve core is not leaking. Tighten it if necessary.

NOTE

If you do not have enough water to immerse sections of the tube, try running your hand over the tube slowly and very close to the surface. If your hand is damp, it works even better. If you suspect a hole anywhere, apply some saliva to the area to verify it.

4. Apply a cold patch using the techniques described under *Cold Patch Repair*, following.
5. Dust the patch area with talcum powder to prevent it from sticking to the tire.
6. Carefully check the inside of the tire casing for small rocks, sand or twigs which may have damaged the tube. If the inside of the tire is split, apply a patch to the area to prevent it from pinching and damaging the tube again.
7. Check the inside of the rim. Make sure the rubber rim band is in place, with no spoke ends protruding, which could puncture the tube.
8. Deflate the tube prior to installing the tire.

Cold Patch Repair

1. Remove the tube from the tire as previously described.
2. Roughen an area around the hole slightly larger than the patch, using the cap from the tire repair kit or a pocket knife. Do not scrape too vigorously or you may cause additional damage.
3. Apply a small amount of the special cement from the kit to the puncture and spread it evenly with your finger.
4. Allow the cement to dry until tacky—usually 30 seconds or so is sufficient.
5. Remove the backing from the patch.

CAUTION

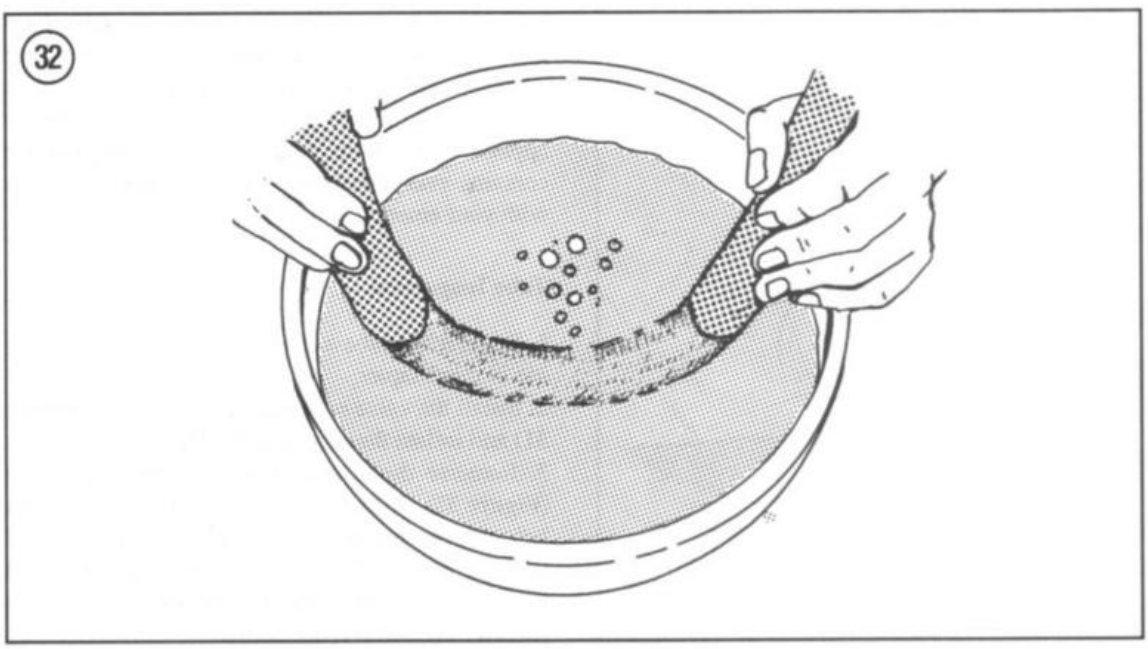
Do not touch the newly exposed rubber with your fingers or the patch will not stick firmly.

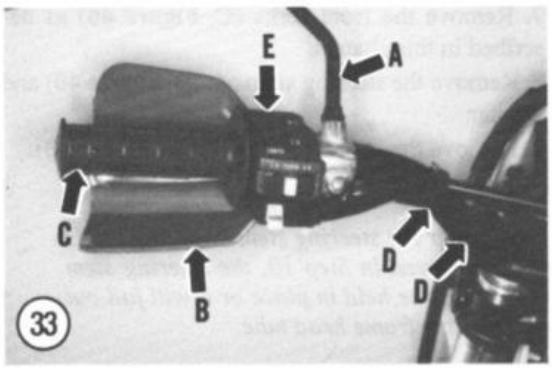
6. Center the patch over the hole. Hold the patch firmly in place for about 30 seconds to allow the cement to set.
7. Dust the patched area with talcum powder to prevent sticking.
8. Install the tube as previously described.

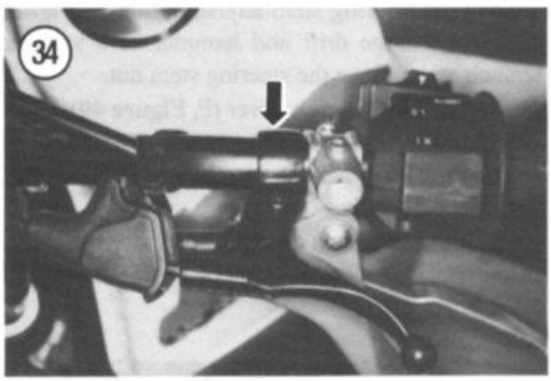
HANDLEBAR

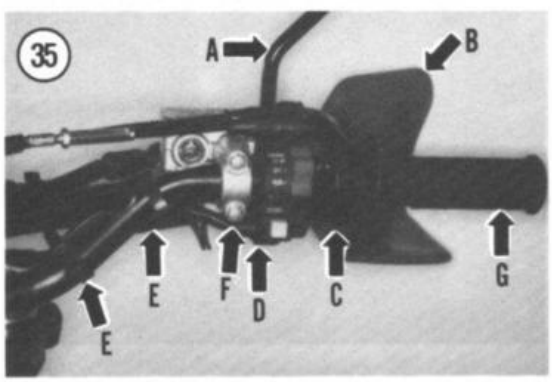
Removal/Installation

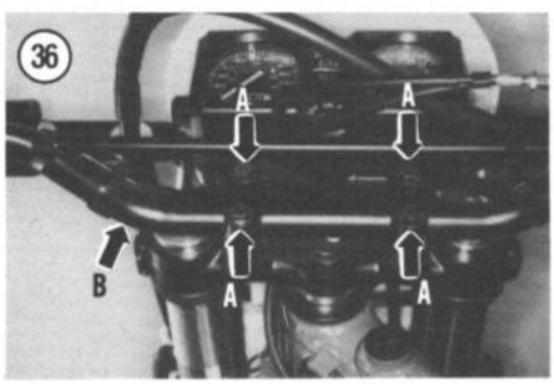
1. Place the bike on the sidestand.
2. From the left-hand side of the handlebar, perform the following:
   a. On models so equipped, remove the rear view mirror (A, **Figure 33**).











b. Remove the upper screw and washer and the lower nut and washer, securing the knuckle guard (B, **Figure 33**) to the clutch lever mounting bolt. Remove the knuckle guard.
c. Remove the left-hand side hand grip (C, **Figure 33**).
d. Remove the electrical cable strap (D, **Figure 33**).
e. Remove the screws securing the left-hand switch (E, **Figure 33**) and remove the switch.
f. Loosen the bolt clamping the clutch lever and on models so equipped, the decompression lever assembly (**Figure 34**).
g. Slide the assembly(ies) off of the handlebar and carefully lay it(them) over the front fender. Be careful not to kink the control cable(s).

3. From the right-hand side of the handlebar, perform the following:
a. On models so equipped, remove the rear view mirror (A, **Figure 35**).
b. Remove the upper screw and washer and the lower nut and washer, securing the knuckle guard (B, **Figure 35**) to the front brake lever mounting bolt. Remove the knuckle guard and top plate.
c. Remove the screws holding the throttle cable housing together.
d. Separate the throttle cable housing (C, **Figure 35**), disconnect the throttle cables and remove the throttle cable housing.
e. Remove the screws securing the right-hand switch assembly (D, **Figure 35**) and separate the assembly.
f. Remove the electrical cable straps (E, **Figure 35**) and remove the right-hand switch assembly from the handlebar.
g. Remove the clamping bolts securing the master cylinder (F, **Figure 35**) to the handlebar and remove the master cylinder. Support the master cylinder in an upright position with a Bungee cord so that it does not hang by its brake hose.
h. Remove the throttle grip assembly (G, **Figure 35**).

4. Remove the bolts (A, **Figure 36**) securing the handlebar upper holders and remove the holders.
5. Remove the handlebar (B, **Figure 36**).
6. Install by reversing these removal steps while noting the following:
a. To maintain a good grip in the handlebar and to prevent it from slipping down, clean the

knurled section of the handlebar with solvent. It should be kept rough so it will be held securely by the holders. The holders should also be kept clean and free of any metal that may have been gouged loose by handlebar slippage.

b. Align the punch mark on the handlebar with the mating surface of the handlebar holders (A, **Figure 37**).
c. Tighten the front bolts first and then the rear bolts securing the handlebar. There must be a gap at the rear (B, **Figure 37**). Tighten to the torque specification listed in **Table 2**.
d. Install the master cylinder clamp so that the "UP" arrow (**Figure 38**) faces up.
e. Apply a light coat of light machine oil to the throttle grip area on the handlebar prior to installation.

WARNING

After installation is completed, make sure the brake lever does not come in contact with the throttle grip assembly when it is pulled on fully.

WARNING

Make sure the front brake and clutch operate properly before riding the bike.

7. Adjust the throttle cables as described under *Throttle Cable Adjustment* in Chapter Three.

STEERING STEM

The steering stem on these models uses tapered roller bearings at both top and bottom pivot locations. Refer to **Figure 39** for this procedure.

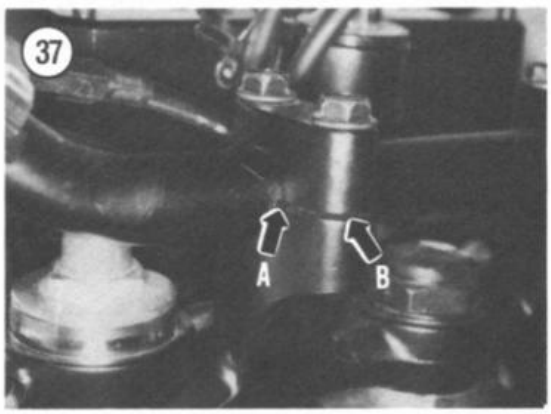
Disassembly

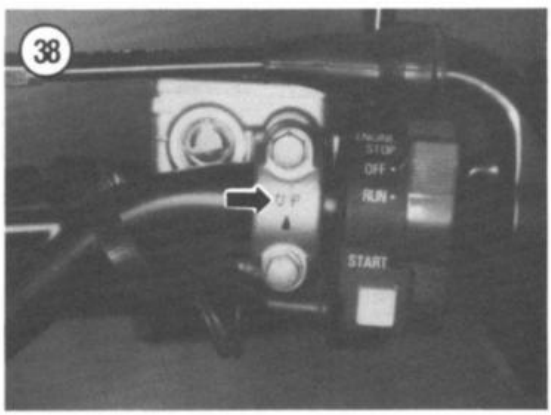
1. Remove the front wheel as described in this chapter.
2. Remove the front fender as described in Chapter Thirteen.
3. Remove the headlight assembly as described in Chapter Nine.
4. Remove the meter housing assembly as described in Chapter Nine.
5. Remove the handlebar (A, **Figure 40**) as described in this chapter.
6. Loosen but do not remove the steering stem nut (B, **Figure 40**).
7. Remove the front forks (C, **Figure 40**) as described in this chapter.
8. Remove the steering stem nut (B, **Figure 40**) and washer.
9. Remove the upper fork bridge (D, **Figure 40**).

NOTE

After the steering stem adjusting nut is removed in Step 10, the steering stem must be held in place or it will fall out of the frame head tube.

10. Have an assistant hold onto the steering stem and remove the steering stem adjusting nut (E, **Figure 40**). Use a large drift and hammer or a spanner wrench and remove the steering stem nut.
11. Remove the bearing cover (F, **Figure 40**).
12. Carefully tap the steering stem down and out of the steering stem bearings in the frame head tube. Remove the steering stem.
13. Don't worry about catching any loose steel balls as the steering stem is equipped with assembled roller bearings.





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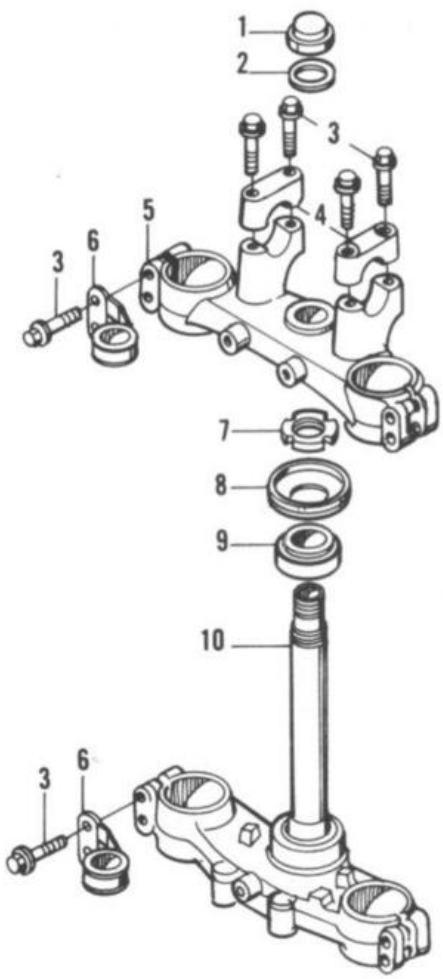
STEERING STEM



1. Steering stem nut
2. Washer
3. Bolt
4. Handlebar upper holder
5. Upper fork bridge
6. Cable guide
7. Steering stem adjust nut
8. Bearing cover
9. Upper bearing
10. Steering stem

14. Remove the upper roller bearing from the top of the steering head portion of the frame tube.

Inspection

1. Clean the bearing races in the steering head, the steering stem races and the tapered roller bearings with solvent.

2. Check the welds around the steering head for cracks and fractures. If any are found, have them repaired by a competent frame shop or welding service.

3. Check the races for pitting or galling and corrosion. If any of these conditions exist, replace the races as described under *Bearing Race Replacement* in this chapter.

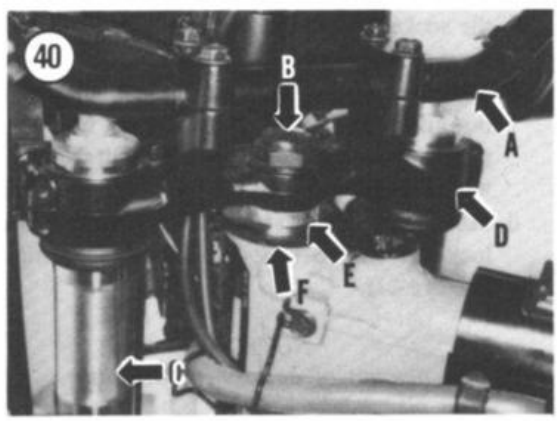
4. Check the steering stem nut, steering stem adjust nut and the upper bearing cover for cracks or damage. Replace if necessary.

5. Check the steering stem for cracks and damage.

6. Check the tapered roller bearings for pitting, scratches or discoloration indicating wear or corrosion. If necessary, replace the lower bearing as follows:

a. Install a bearing puller onto the steering stem and bearing.
b. Pull the bearing off of the steering stem.
c. Clean the steering stem thoroughly in solvent.
d. Slide a new bearing onto the steering stem until it stops.
e. Align the bearing with the machined portion of the shaft and slide a long hollow pipe over the steering stem until it seats against the inner bearing race. Drive the bearing onto the shaft until it bottoms out.

40



7. Check the upper and lower fork bridges for cracks or damage, especially where the fork tubes mount.

Headset Race Replacement

To remove an upper or lower headset race, insert a hardwood stick or soft punch into the frame's head tube and carefully tap the race out from the inside. After it is started, tap around the race so that neither the race nor the head tube is damaged.

To install the headset race, tap it in slowly with a block of wood (**Figure 41**) or suitable size socket or piece of pipe. Make sure each race is squarely seated in the race bores before tapping them in. Tap them in until they are flush with the steering head.

Steering Head Assembly

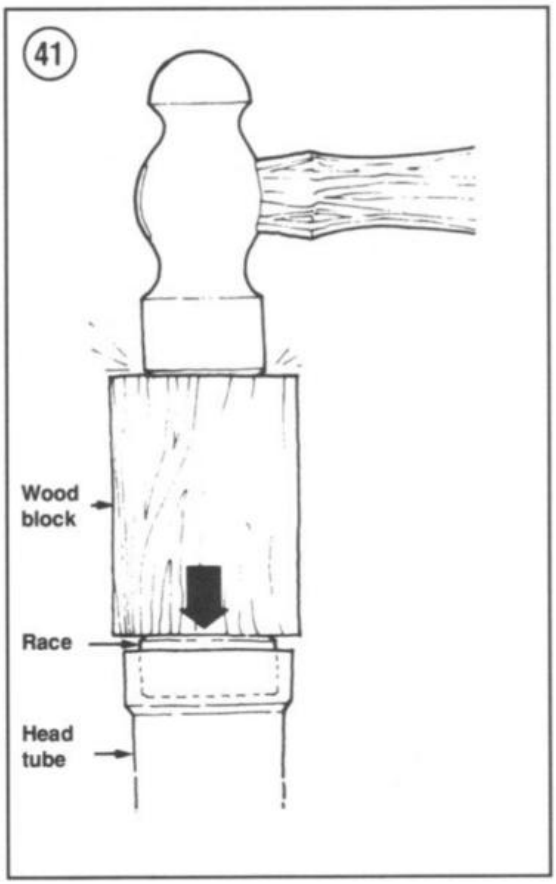
Refer to **Figure 39** for this procedure.

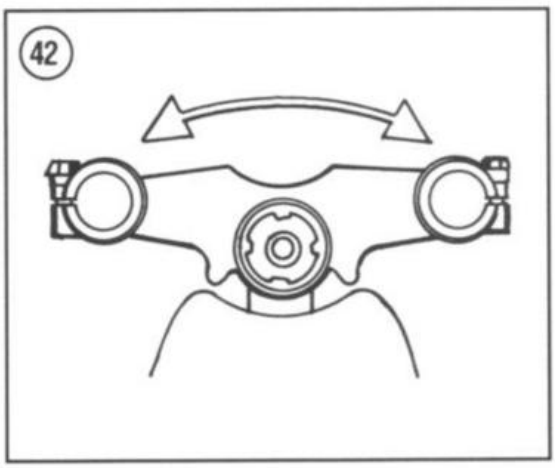
1. Make sure the steering head races and stem lower bearing are properly seated.
2. Apply a coat of bearing grease to both tapered roller bearings. Carefully work the grease into the rollers.
3. Install the steering stem into the head tube and hold it firmly in place.
4. Install the upper bearing into the steering head race. Push the bearing down to seat it in the race.
5. Install the bearing cover (F, **Figure 40**).
6. Install and tighten the steering stem adjusting nut as follows:
   a. Install the steering stem adjusting nut (E, **Figure 40**). To avoid over tightening the adjusting nut, use the Suzuki socket nut wrench (part No. 09940-14920) and a torque wrench.
   b. Engage the socket nut wrench with the adjusting nut. Attach a torque wrench onto the end of the socket nut wrench so that both wrenches form a right angle.
   c. Tighten the adjust nut to the torque specification listed in **Table 2**. If you do not have the ring nut wrench, tighten the adjust nut securely with a spanner wrench.
   d. Move the steering stem back and forth from lock-to-lock 5-6 times to seat the bearings (**Figure 42**).

NOTE

The amount of adjustment will vary from bike to bike.

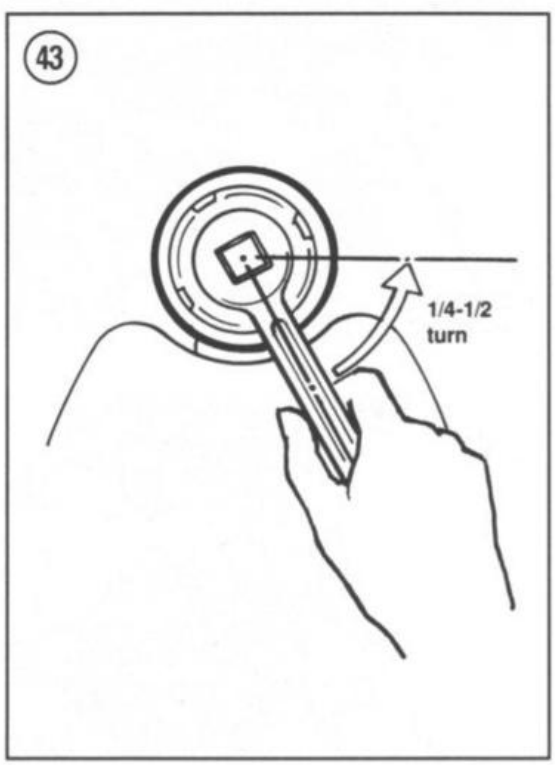
   e. For final adjustment, loosen the adjust nut 1/4 to 1/2 turn (**Figure 43**).
   f. After the steering stem adjust nut is tightened, check the bearing play. The adjusting nut should be just tight enough to remove play, both horizontal and vertical yet loose enough





so that the assembly will turn to both lock positions under its own weight after an assist.

7. Install the upper fork bridge (D, **Figure 40**).
8. Install the washer and the steering stem nut (B, **Figure 40**) and tighten only finger-tight at this time.
9. Slide both fork tubes (C, **Figure 40**) into position as described in this chapter and tighten *only the lower pinch bolts* to the torque specification in **Table 2**. This is necessary to correctly align the upper and lower fork bridges in relation to the front forks.
10. Have an assistant hold onto the front fork assemblies between the fork bridges. Tighten the steering stem nut to the torque specification in **Table 2**.
11. Make sure the forks are still aligned correctly with the upper fork bridge, then tighten the upper fork pinch bolts to the torque specification in **Table 2**.
12. Install the handlebar (A, **Figure 40**) as described in this chapter.
13. Install the meter housing assembly as described in Chapter Nine.
14. Install the headlight assembly as described in Chapter Nine.
15. Install the front fender as described in Chapter Thirteen.



16. Install the front wheel as described in this chapter.

Steering Adjustment

1. Raise the front wheel off the ground. Support the motorcycle securely under the engine.
2. Loosen the lower fork tube pinch bolts.
3. Loosen the steering stem nut.
4. Turn the steering stem adjusting nut with a spanner wrench or punch until you just feel the steering play taken up.
5. Tighten the steering stem nut to the torque specification in **Table 2**.
6. Recheck the steering play.
7. Tighten all bolts to the torque specifications in **Table 2**.

FRONT FORK

The Suzuki front fork is spring-controlled and hydraulically damped. Before suspecting major trouble with the front fork, drain the fork oil and refill with the proper type and quantity. If you still have trouble, such as poor damping, tendency to bottom out or top out, or leakage around the rubber seals, then follow the service procedures in this section.

To simplify fork service and to prevent the mixing of parts, the fork legs should be removed, serviced and reinstalled individually.

Each front fork leg consists of the fork tube (inner tube), slider (outer tube), fork spring, damper rod with its damper components and bushings. Spring pre-load and damping can be adjusted as described in this chapter.

If the front fork is going to be removed without disassembly, perform the *Removal* and *Installation* procedure in this chapter. If the front fork requires disassembly, refer to *Disassembly* in this chapter.

NOTE

The procedures within this section do ***not*** *relate to the U.K. version of the DR350S that is equipped with an optional Suzuki Height Control system. This system is not covered in this manual as noted at the beginning of this chapter.*

Removal

1. Remove the front wheel (A, **Figure 44**) as described in this chapter.

2. Remove the front brake caliper (B, **Figure 44**) as described in Chapter Twelve.

3. Loosen the clamps securing the front brake hose (C, **Figure 44**) and the meter cable (D, **Figure 44**) to the left-hand fork slider.

4A. If the fork assembly is going to be disassembled, perform the following:

a. Loosen the upper (A, **Figure 45**) fork bridge pinch bolts.
b. Use a 24 mm socket and loosen the fork cap bolt (B, **Figure 45**).
c. Proceed to Steps 1-5 of *Disassembly* procedure in this section.

4B. If the fork assembly is *not* going to be disassembled, just going to be removed, perform the following:

a. Loosen the upper and lower fork bridge pinch bolts (**Figure 46**).
b. Twist the upper fork tube and slide the fork tube out of the upper and lower fork bridge.

5. Repeat for the opposite side.

Installation

1. On models so equipped, apply a light coat of WD-40, or equivalent, to the rubber grommets (**Figure 47**) within the headlight mounting bracket. This will make it easier to slide the fork tube through them.

2. Install the fork tube up through the lower and upper fork bridges.

3. Align the index line on the fork tube with the top surface of the upper fork bridge (**Figure 48**).

4A. If the fork was disassembled for service, perform the following:

a. Tighten the *lower* fork bridge pinch bolts sufficiently to hold the fork tube from turning while tightening the top cap bolt.
b. Tighten the top cap bolt (B, **Figure 45**) to the torque specification in **Table 2**.
c. Tighten the upper and lower fork bridge pinch bolts to the torque specification in **Table 2**.

4B. If the fork assemblies were not disassembled, tighten the upper and lower fork bridge pinch bolts (**Figure 46**) to the torque specification in **Table 2**.

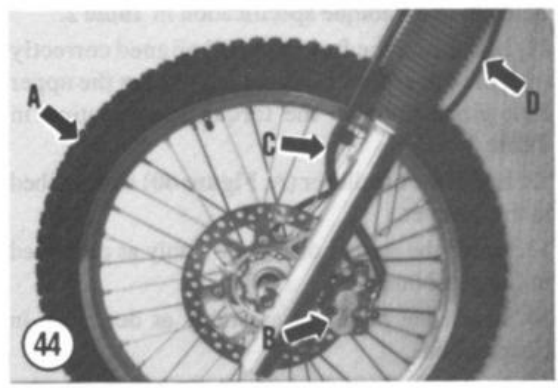
5. Position the front brake hose and the speedometer cable into their respective clamps on the left-hand fork slider and tighten the clamps securely.

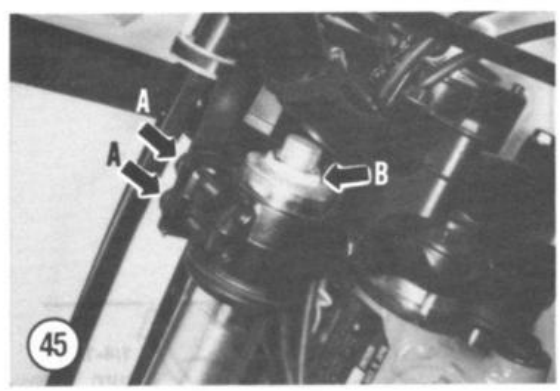
6. Install the front wheel as described in this chapter.

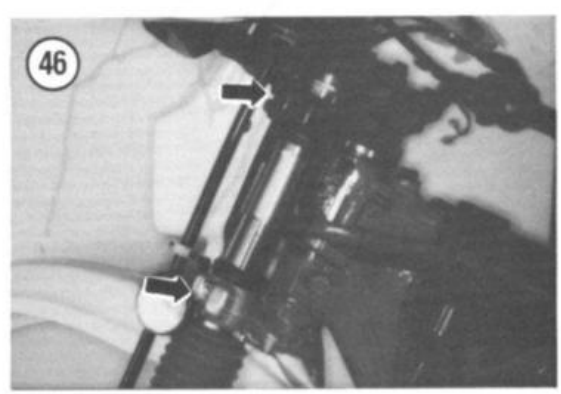
7. Install the front brake caliper as described in Chapter Twelve.

WARNING

After installing the front brake caliper, squeeze the front brake lever. If the







brake lever feels spongy, bleed the brake as described under ***Bleeding the System*** *in Chapter Twelve.*

Disassembly

Refer to **Figure 49** for this procedure.

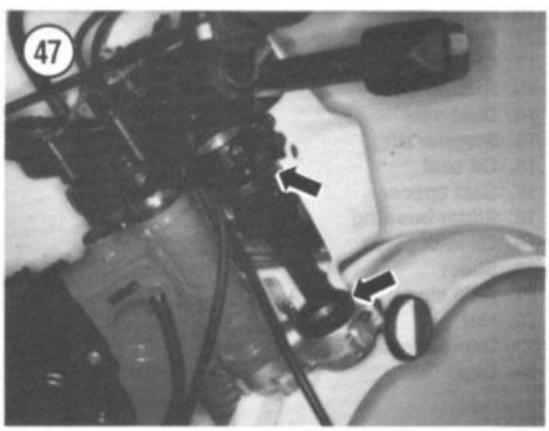
Fork tube disassembly is easier if Steps 1-5 of this procedure is performed while the fork tubes are mounted on the bike.

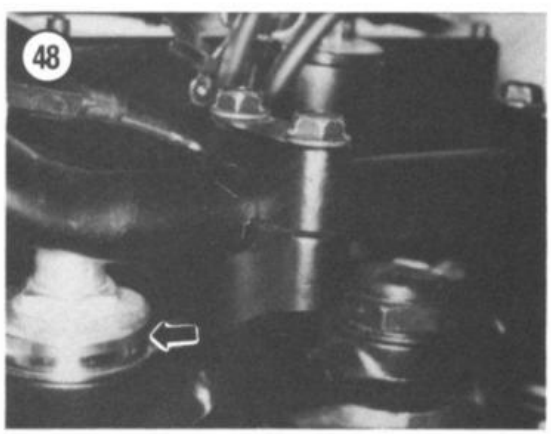
NOTE

If you recycle your old engine oil ***never*** *add used fork oil to the old engine oil. Most oil retailers that accept old oil for recycling may not accept the oil if other fluids (fork oil, brake fluid or any other type of petroleum based fluids) have been combined with it.*

NOTE

The fork slider damper rod bolt is secured with a locking agent and is hard to remove. If a heavy duty air powered impact wrench is available, try that first. If necessary, you may be able to keep the damper rod inside from turning by having an assistant compress the fork, placing pressure on the bolt, while you try to loosen the damper rod bolt. If these methods are not successful, you will have to remove the fork assembly and use special Suzuki tools as described later in this procedure.





1. To loosen the damper rod bolt with the fork assembly still installed on the bike, perform the following:
   a. Remove the cap on the base of the slider.
   b. Have an assistant sit on the bike and apply the front brake, then push down on the handlebar to compress the fork spring. This will help to lock the damper rod bolt in place.

NOTE

In the following step, loosen but do not remove the damper rod bolt as the fork oil will drain out. When the bolt is loosened some fork oil may drip out. If this happens, tighten the bolt by hand to stop the dripping.

NOTE

Figure 50 *is shown with the fork assembly removed for clarity.*

   c. First try to loosen the damper rod bolt (**Figure 50**) with a 24 mm socket wrench. If the bolt will not loosen, proceed to substep d.
   d. Use an heavy duty air-powered impact wrench and loosen the damper rod bolt.
   e. If the bolt still cannot be broken loose, continue with this procedure and in Step 9b, the bolt can be loosened using special tools.

2. Loosen the clamps on the dust boot and slide the lower end of the boot (A, **Figure 51**) up and off of the fork slider.

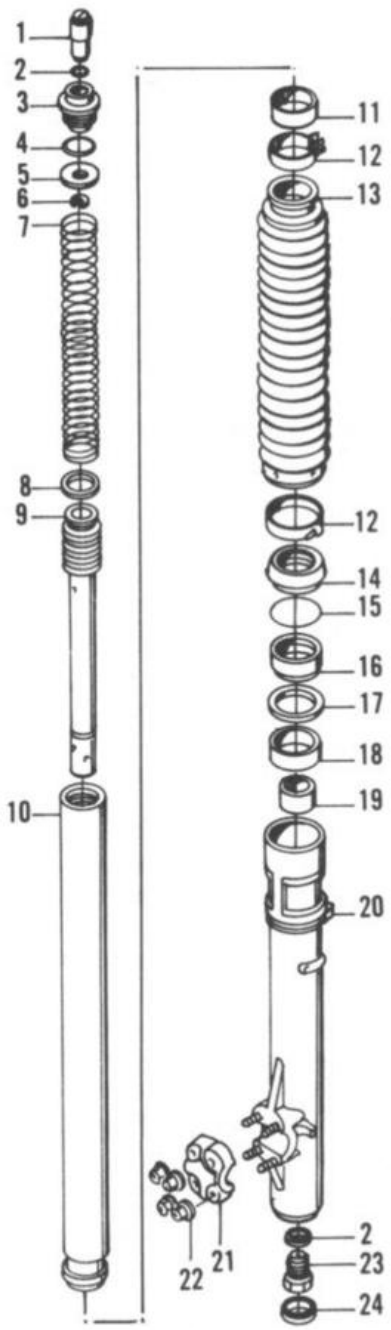
3. Loosen the dust seal from the slide and move it up the fork tube.

4. Remove the stopper ring securing the oil seal into the slider.

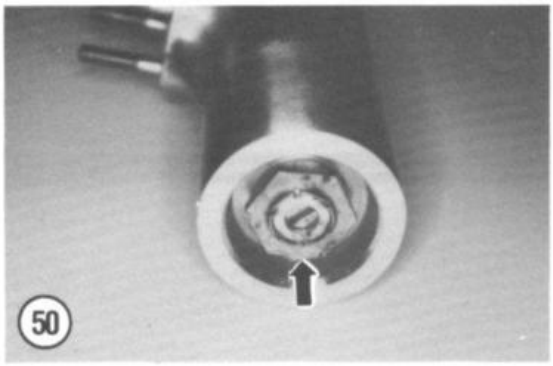
5. There is an interference fit between the bushing in the fork slider and the bushing on the fork tube. In order to remove the slider from the fork tube, pull down hard on the slider (B, **Figure 51**) using quick in-and-out strokes. Doing this will withdraw the oil

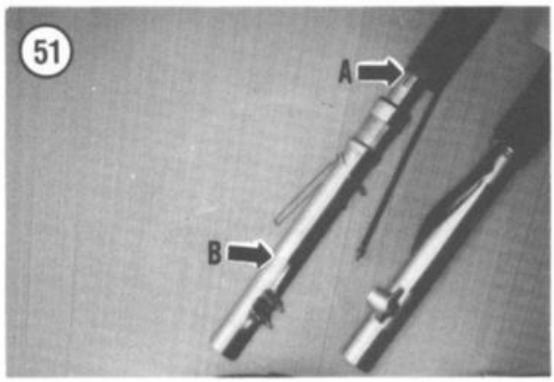
(49)

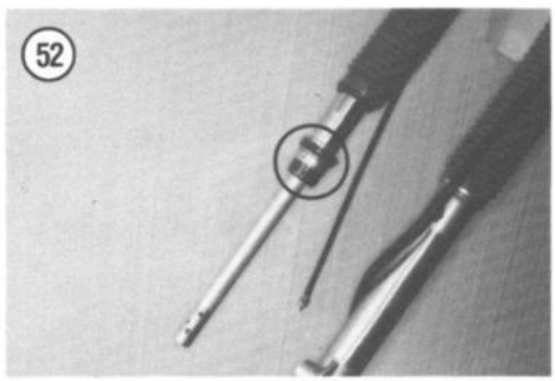
FRONT FORK

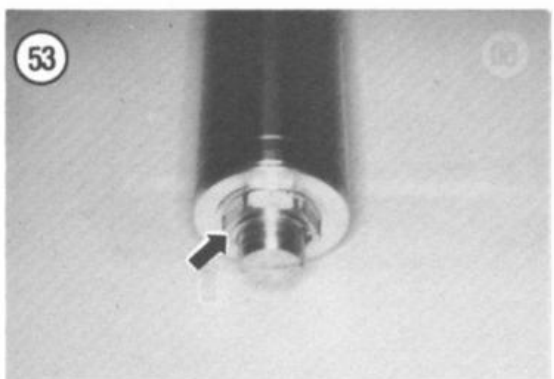


1. Pre-load adjuster
2. O-ring
3. Fork cap bolt
4. O-ring
5. Spring seat
6. E-ring
7. Spring
8. Piston ring
9. Damper rod and rebound spring
10. Fork tube
11. Fork tube bushing
12. Clamp
13. Rubber boot
14. Dust seal
15. Stopper ring
16. Oil seal
17. Seal spacer
18. Slider bushing
19. Oil lock piece
20. Slider
21. Axle clamp
22. Nut
23. Damper rod bolt
24. Cap









seal, seal spacer and slider bushing (**Figure 52**) from the fork slider.

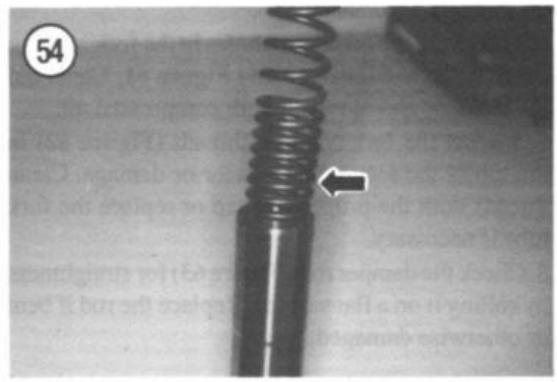
6. Remove the forks as described in this chapter.
7. Remove the fork cap bolt (**Figure 53**) and spring (**Figure 54**).
8. Turn the fork assembly upside down and drain out the fork oil.

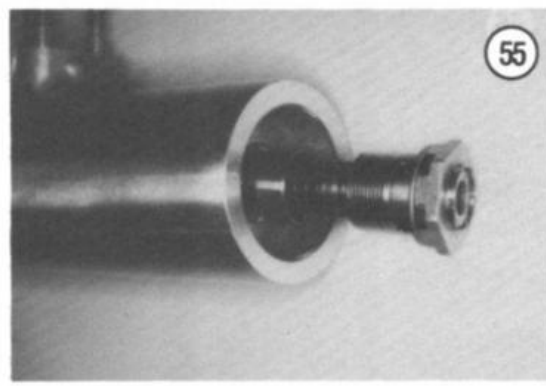
9A. Remove the damper rod bolt (**Figure 55**).

9B. If you were unable to previously loosen the damper rod bolt, perform the following:

a. Install the Suzuki special tool Damper Rod Attachment (part No. 09940-34530) onto the Suzuki special tool long T-handle (part No. 09940-34520). You can substitute the long T-handle with a short socket wrench and a very long 3/8 in. drive extension.
b. Insert the damper rod attachment into the fitting on top of the damper rod and hold the damper rod steady with the T-handle.
c. Use a 24 mm socket wrench and loosen the damper rod bolt (**Figure 50**) and remove the damper rod bolt and gasket.

10. Slide the boot up and off of the fork tube.
11. Separate the slider from the fork tube.

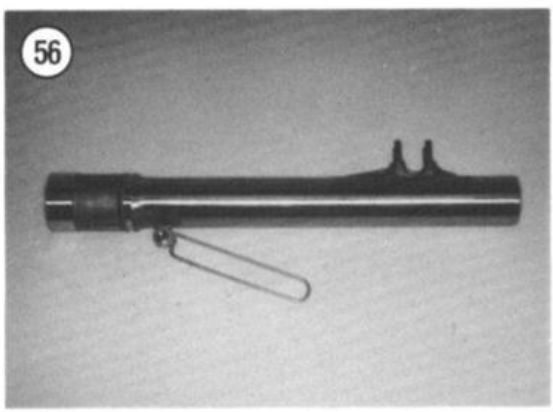


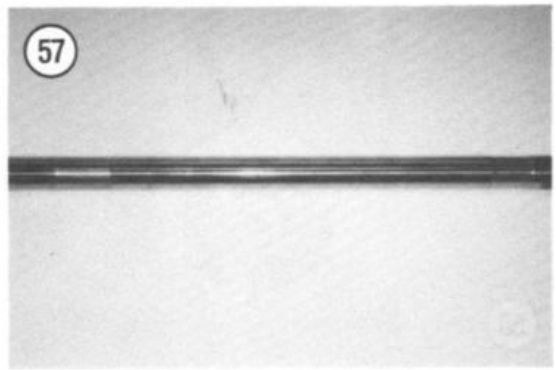


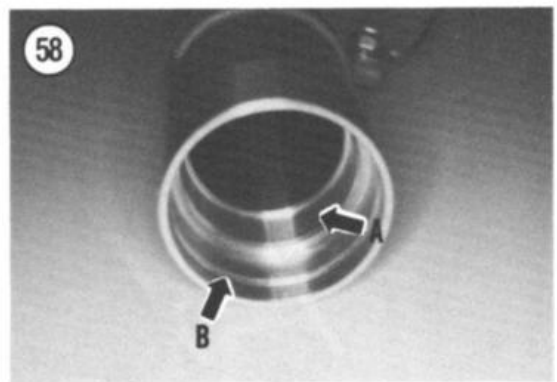
12. Remove the oil lock piece from the end of the damper rod.
13. Slide the damper rod and rebound spring out of the fork tube.
14. Slide the dust seal, oil seal, seal spacer and slider bushing off of the fork tube.

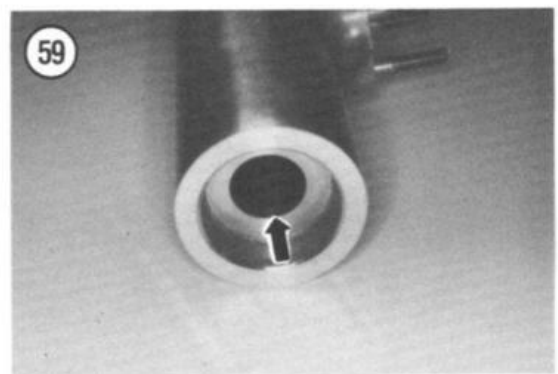
Inspection

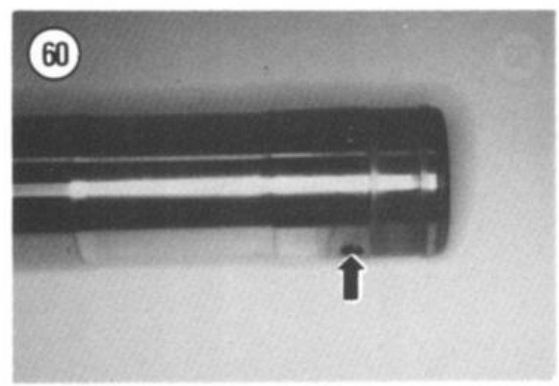
1. Thoroughly clean all parts in solvent and dry them.
2. Check both fork slider (**Figure 56**) and tube for wear or scratches.
3. Check the fork tube for straightness (**Figure 57**). If the fork tube is slightly bent, it may be straightened with a hydraulic press. If the fork tube is bent to the point that it has creased or the chrome has flaked, the fork tube must be replaced.
4. Check the oil seal area in the slider (A, **Figure 58**) for dents or other damage that would allow oil leakage. Check the clip groove (B, **Figure 58**) in the slider for cracks or other damage. Replace the slider if necessary.
5. Check the damper rod bolt receptacle (**Figure 59**), in the base of the slider for wear or damage, replace the slider if necessary.
6. Make sure the oil control holes in the fork tube are open. Refer to **Figure 60** and **Figure 61**. Clean out if necessary and blow out with compressed air.
7. Inspect the fork cap bolt threads (**Figure 62**) in the top of the fork tube for wear or damage. Clean threads with the proper size tap or replace the fork tube if necessary.
8. Check the damper rod (**Figure 63**) for straightness by rolling it on a flat surface. Replace the rod if bent or otherwise damaged.

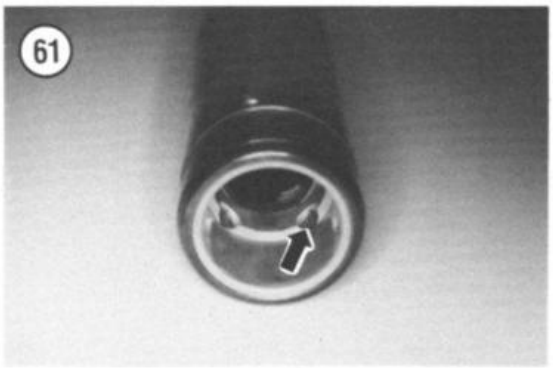


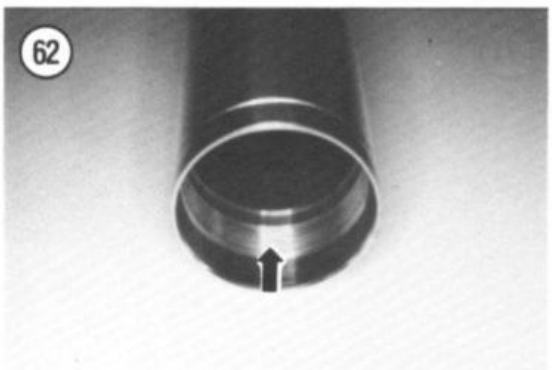


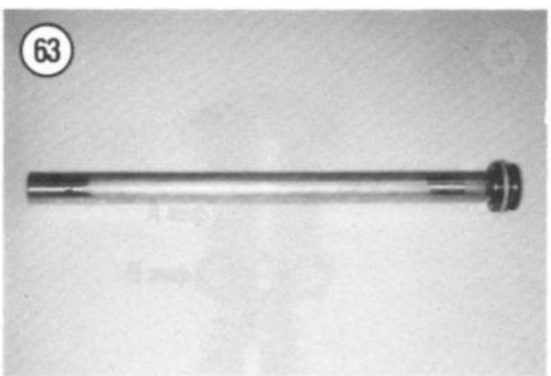












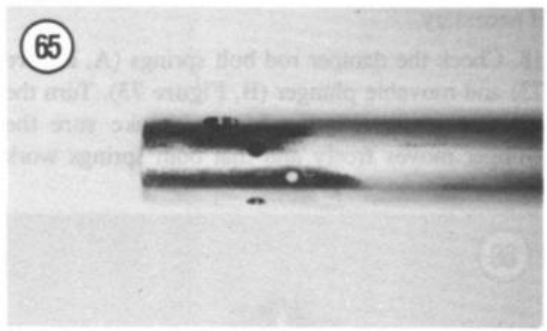
9. Check the damper rod piston ring (**Figure 64**) for damage.

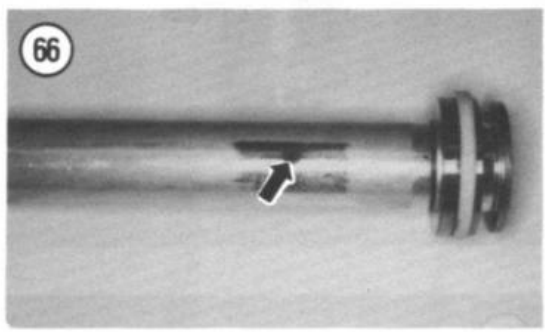
10. Make sure the oil passages in the damper rod are open and free of dirt or foreign matter. Refer to **Figure 65** and **Figure 66**. Clean out if necessary with solvent and blow dry with compressed air.

NOTE

If an aftermarket fork spring has been installed, the uncompressed length may differ from the stock Suzuki fork spring. Refer to manufacturer's literature for their service limit spring length.

11. Measure the uncompressed length of the fork spring (**Figure 67**) and compare to specifications in





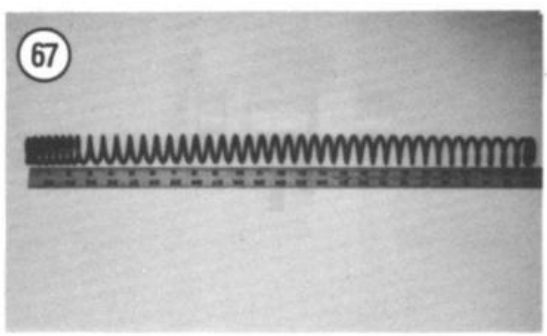


Table 1 for the stock Suzuki fork spring. Replace the fork spring if it has sagged to the service limit or less.

12. Replace the fork cap bolt O-ring (**Figure 68**), if deformed, damaged or is starting to deteriorate.

13. Inspect the fork cap bolt threads (**Figure 69**) for wear or damage. Clean threads with the proper size die or replace the fork cap bolt if necessary.

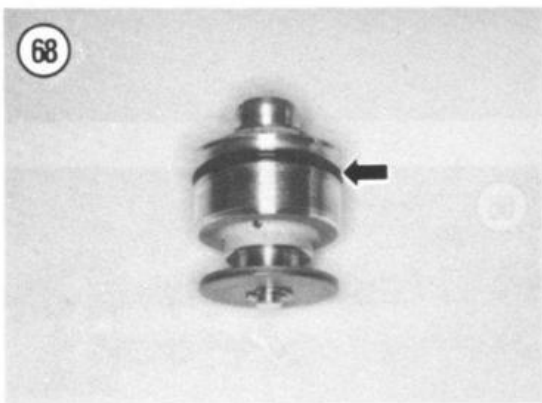
14. Check that the E-clip is properly securing the spring seat (**Figure 70**). Replace if necessary.

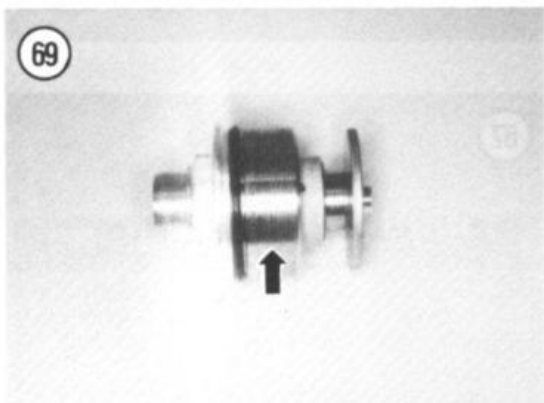
15. Make sure the adjuster bolt (**Figure 71**) is free to rotate smoothly, replace if necessary.

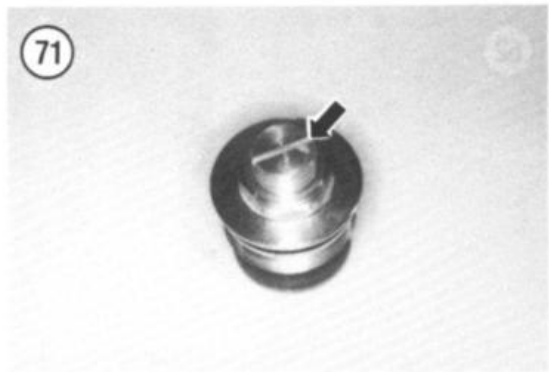
16. Inspect the threads (A, **Figure 72**) on the damper rod bolt for wear or damage. Clean threads with the proper size die or replace the bolt.

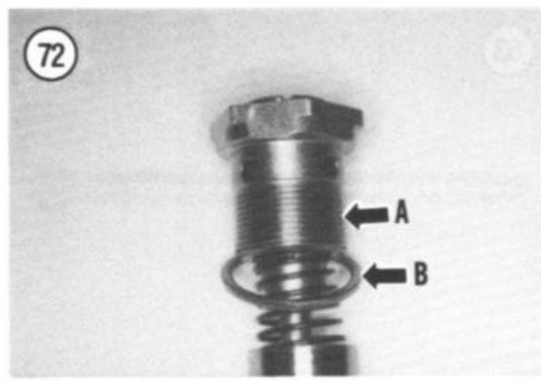
17. Check the damper rod bolt washer (B, **Figure 72**) for damage that would allow oil leakage; replace if necessary.

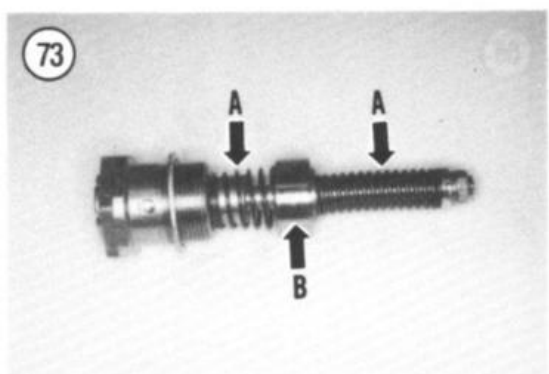
18. Check the damper rod bolt springs (A, **Figure 73**) and movable plunger (B, **Figure 73**). Turn the adjuster screw (**Figure 74**) and make sure the plunger moves freely and that both springs work

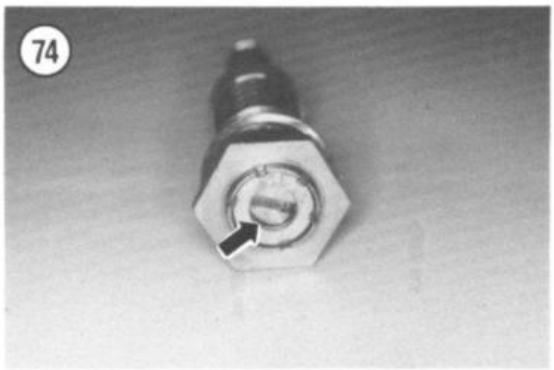


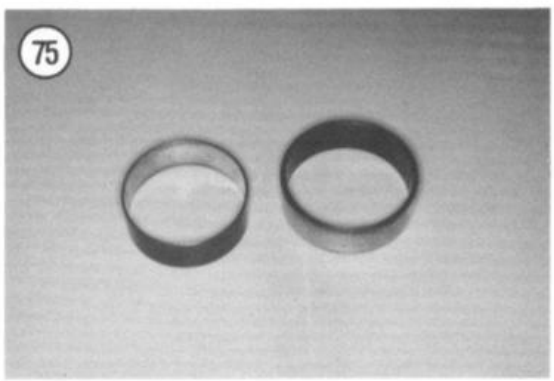


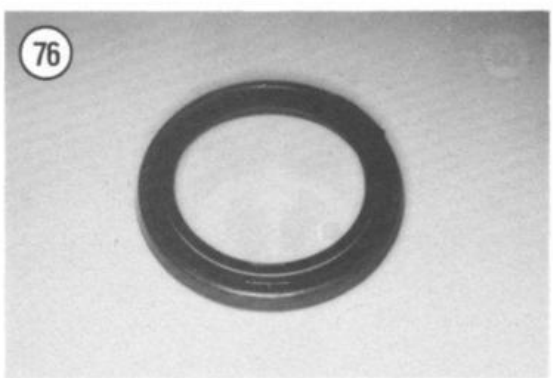


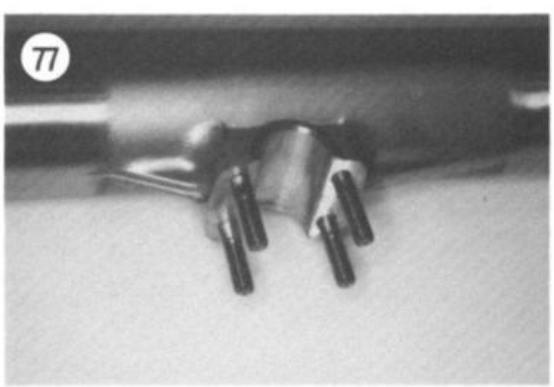












properly. If any portion of the damper rod bolt assembly is worn or damaged, replace it.

19. Inspect the fork tube bushing and slider bushing (**Figure 75**). If the Teflon coating is worn off so that the copper base material is showing on approximately 3/4 of the total surface, the bushing must be replaced.

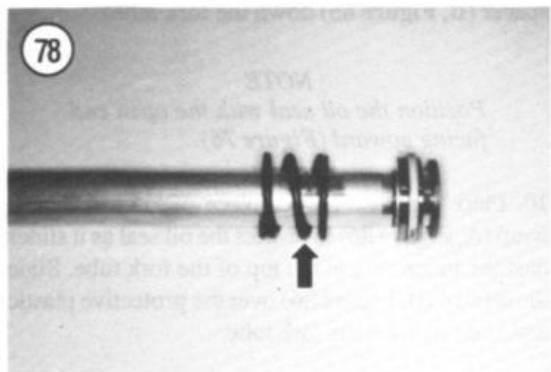
20. Check the oil seal (**Figure 76**) and dust seal for tears or other damage that would allow oil leakage. Replace the seal if it is damaged or if necessary. Replace both seals as a set even if only one is faulty.

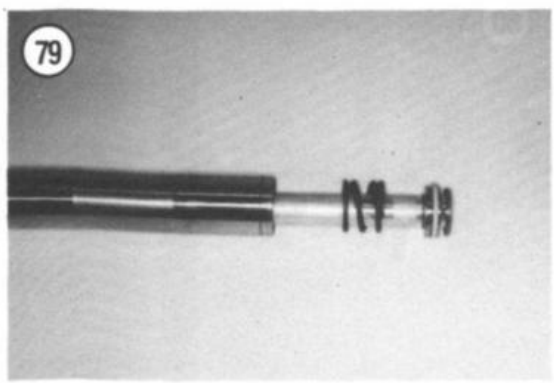
21. Inspect the threads on the front axle holder studs (**Figure 77**) on the right-hand slider for wear or damage. Clean threads with the proper size thread die or replace the fork slider if necessary. The studs are not available separately from Suzuki.

Assembly

Refer to **Figure 49** for this procedure.

1. Slide the rebound spring (**Figure 78**) onto the damper rod and insert the damper rod and spring into the fork tube (**Figure 79**).





2. Slide the oil lock piece (**Figure 80**) onto the end of the damper rod.

3. Install the bushing (A, **Figure 81**) onto the fork tube.

4. Install the fork tube assembly into the fork slider (B, **Figure 81**). Push the fork tube down until the damper rod bottoms out on the slider.

5. Position the fork spring with the closer wound coils toward the bottom and temporarily insert the fork spring (**Figure 82**) into the fork tube.

6. Temporarily install the fork cap bolt (**Figure 83**) into the fork tube. Tighten the fork cap bolt by hand until it seats. Do not tighten with a wrench as it will be removed to add fork oil later in this procedure.

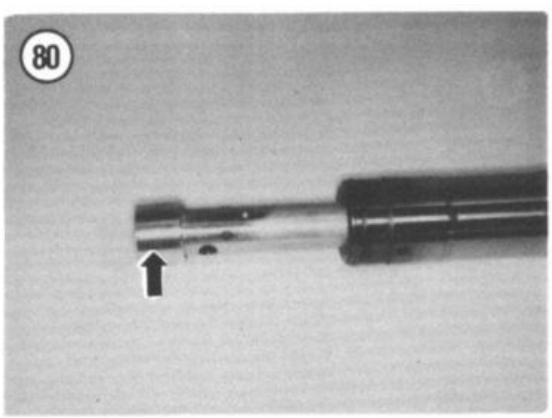
7. Make sure the gasket (B, **Figure 72**) is on the damper rod bolt (A, **Figure 72**).

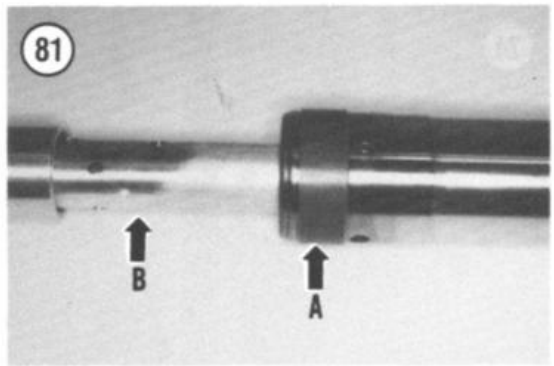
8. Apply blue Loctite (No. 242) to the threads on the damper rod bolt. Install the bolt (**Figure 84**) and tighten to the torque specification listed in **Table 2**. If necessary, hold the fork assembly upside down and compress the fork assembly to apply pressure on the damper rod to keep it from turning while tightening the bolt.

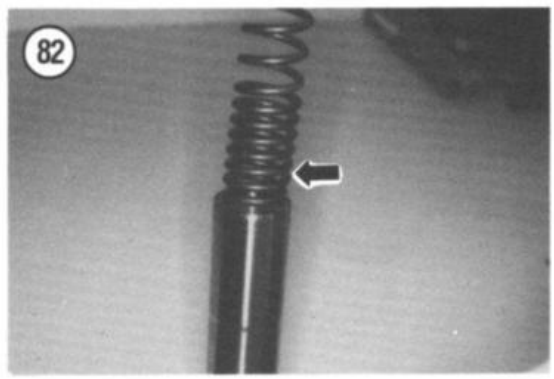
9. Slide the slider bushing (A, **Figure 85**) and seal spacer (B, **Figure 85**) down the fork tube.

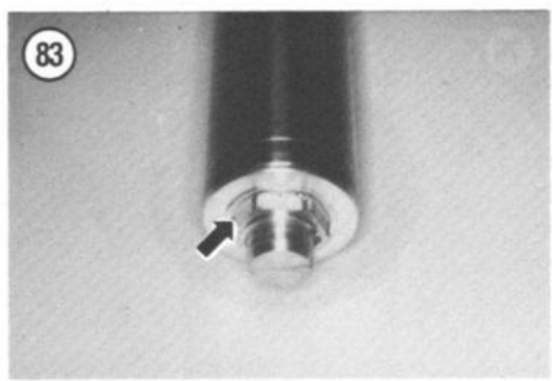
NOTE
*Position the oil seal with the open end facing upward (**Figure 76**).*

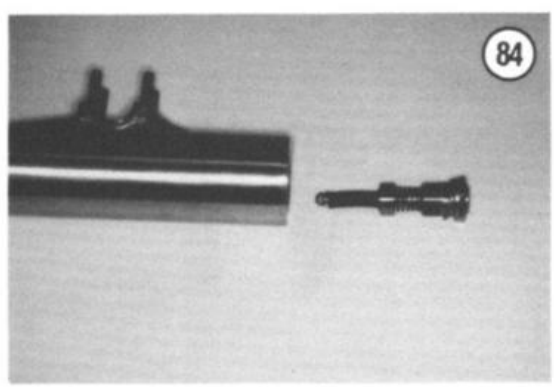
10. Place a plastic bag or piece of kitchen plastic wrap (A, **Figure 86**) to protect the oil seal as it slides past the index ring at the top of the fork tube. Slide the oil seal (B, **Figure 86**) over the protective plastic and slide it down the fork tube.

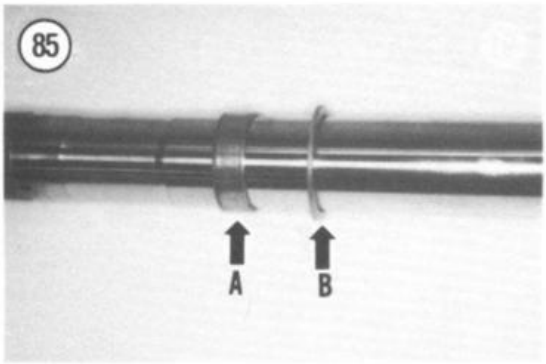


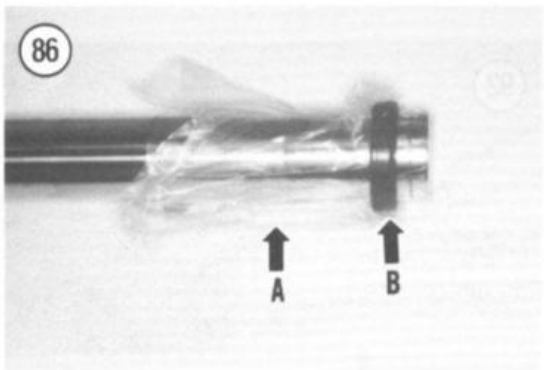


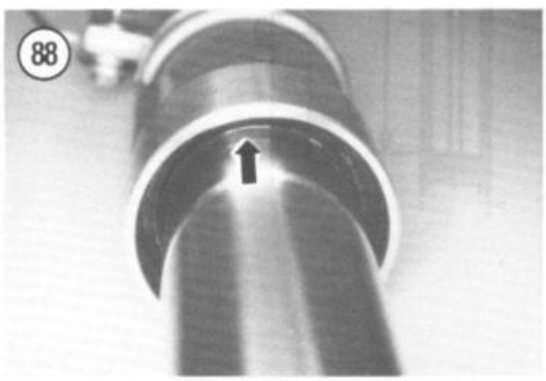












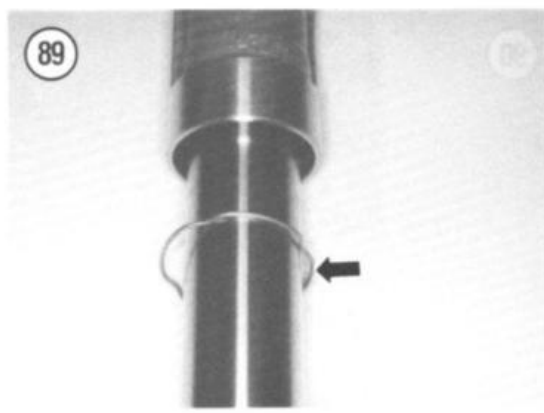
NOTE

*Some type of fork seal driver is required to install the guide bushing and oil seal. Suzuki sells a fork seal driver set (part No. 09940-050113). The adjustable fork seal driver (**Figure 87**) is available from Suzuki dealers and can be used on almost all Japanese fork assemblies (including Japanese "Showa" forks equipped on some late model Harleys).*

NOTE

If you do not have a special tool, the guide bushing and oil seals can be installed with a piece of pipe or other piece of tubing that fits over the fork tube. If both ends of the pipe are threaded, wrap one end with duct tape to prevent the threads from damaging the interior of the slider.

11. Tap the slider bushing, seal spacer and oil seal into the slider until the oil seal bottoms out and is below the stopper ring groove in the slider (**Figure 88**). It may be necessary to use a flat bladed screwdriver and hammer to tap the oil seal all the way down past the groove in the slider.
12. Install the stopper ring (**Figure 89**). Make sure it is completely seated in the slider groove.
13. Slide the dust seal onto the fork tube and rest it on top of the oil seal.
14. Tap the dust seal (**Figure 90**) into the slider until it bottoms out.
15. Install the dust boot (**Figure 91**) onto the fork tube. Correctly position the lower end of the boot onto the raised boss (**Figure 92**) on the slider and tighten the clamp screw securely. Do not tighten the upper screw at this time.



16. Remove the fork cap bolt and spring.

17. Fill the fork tube with the correct quantity and weight fork oil. Refer to **Table 1** for specified weight and quantity.

18. Check the oil level in the fork assembly as follows:

a. Hold the fork assembly vertical and *completely* compress the fork tube into the slider.

b. Use an accurate ruler or the Suzuki Oil Level Gauge (part No. 09943-74111) and measure the distance from the top surface of the fork tube (**Figure 93**). Adjust the oil level as necessary.

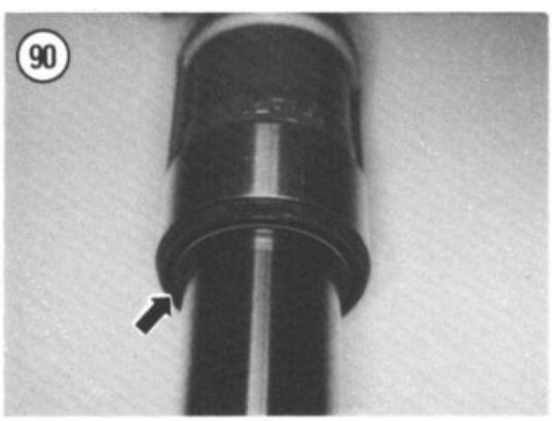
NOTE

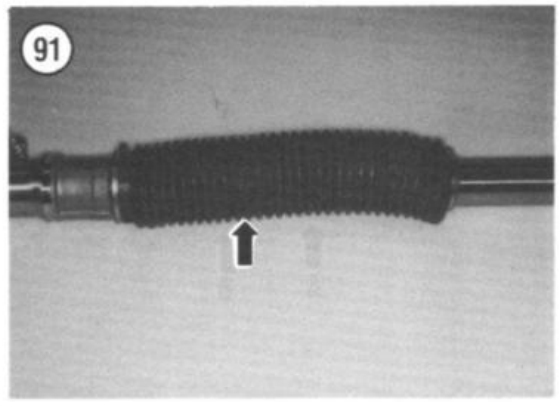
*An oil level measuring device can be made as shown in **Figure 94**. Position the lower edge of the hose clamp the specified oil level distance up from the small diameter hole. Fill the fork with a few cc's more than the required amount of oil. Position the hose clamp on the top edge of the fork tube and draw out the excess oil. Oil is sucked out until the level reaches the small diameter hole. A precise oil level can be achieved with this simple device.*

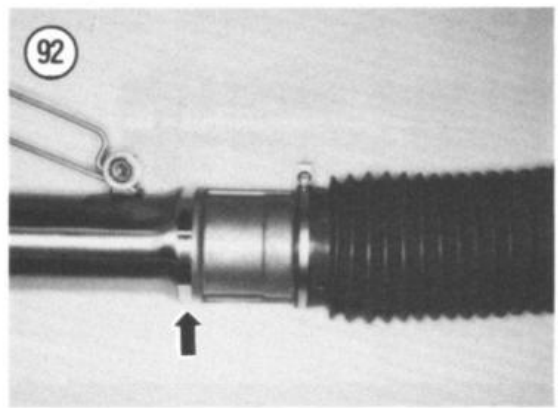
19. Slide the fork tube up from the slider until it stops.

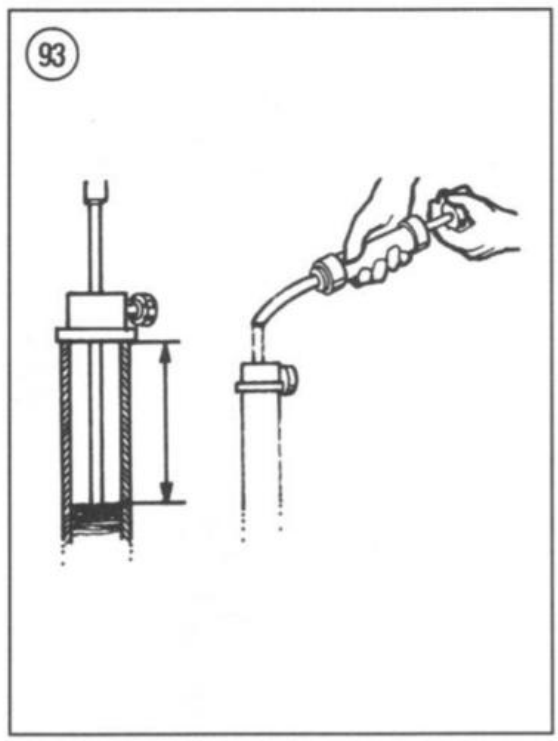
20. Position the fork spring with the closer wound coils toward the bottom and insert the fork spring (**Figure 82**) into the fork tube.

21. Install the fork cap bolt (**Figure 83**) into the fork tube. Tighten the fork cap bolt by hand securely. Do not tighten with a wrench as it will be tightened after the fork assembly is installed on the bike.





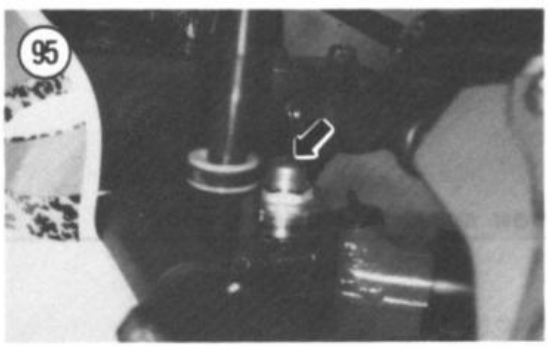




22. Install the fork assemblies onto the bike as described in this chapter.
23. Move the dust boot up into position to the lower surface of the lower fork bridge. Tighten the lower clamp screw securely.

Front Fork Spring Preload Adjustment

The front fork spring can be adjusted to six different preload settings. Position No. 1 is the stiffest and No. 6 is the softest. The standard setting is the No. 3 position.



WARNING

Adjust both fork springs to the same preload position (e.g. both set on No. 4). If the fork assemblies are adjusted to different settings it will result in an unsafe riding condition that could lead to an accident.

To adjust the preload, use a flat bladed screwdriver and rotate the adjuster (**Figure 95**) within the fork cap bolt. The No. 1 (stiffest) position is with the adjuster screwed all the way down in to the fork cap bolt. The No. 6 position (softest) is with the adjuster screwed all the way up out of the fork cap bolt.

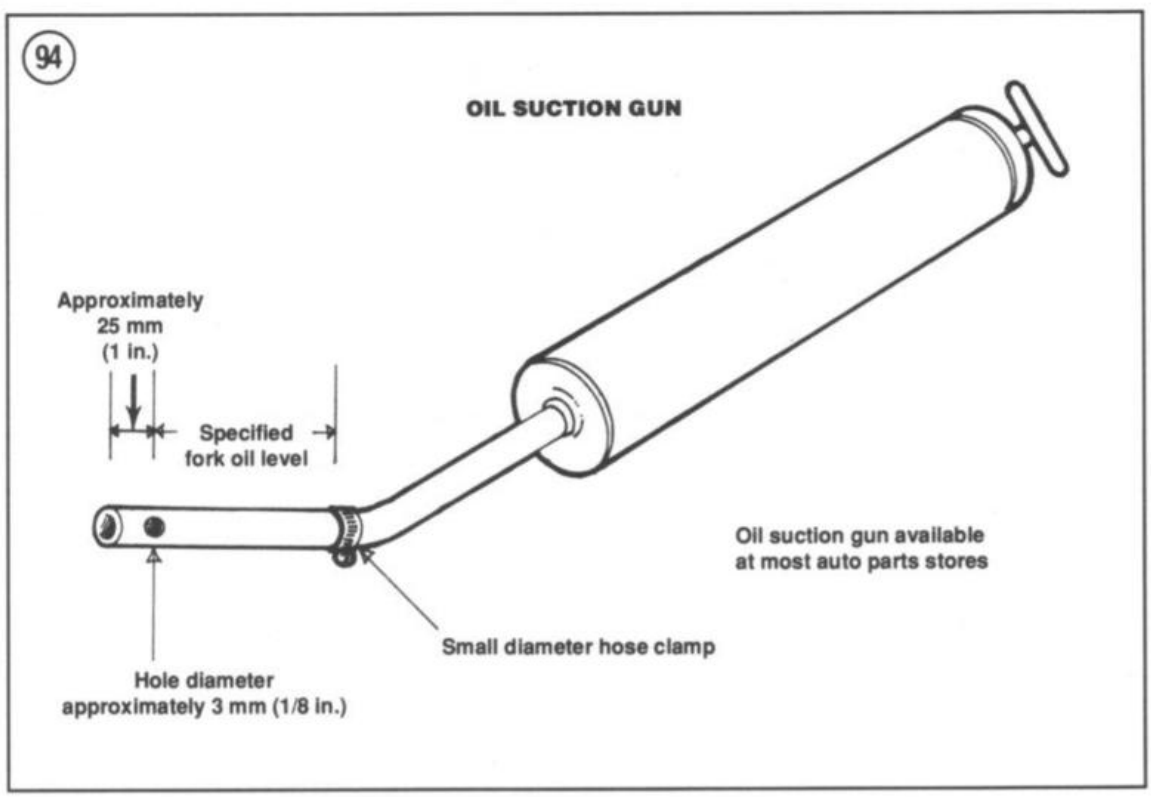
Front Fork Damping Adjustment

The front fork can be adjusted to seven different damping settings by rotating the adjuster in the base of the slider.

WARNING

Adjust both fork damping adjusters to the same damping position (e.g. both set on the No. 4 click out). If the fork assem-

10


94
OIL SUCTION GUN
Approximately 25 mm (1 in.)
Specified fork oil level
Oil suction gun available at most auto parts stores
Small diameter hose clamp
Hole diameter approximately 3 mm (1/8 in.)

blies are adjusted to different settings it will result in an unsafe riding condition that could lead to an accident.

To adjust the preload, use a flat bladed screwdriver and rotate the adjuster (**Figure 96**) located in the base of the slider. The stiffest damping setting is with the adjuster turned all the way in until it stops. To soften the damping setting, turn the adjuster out and listen for the clicks. The 7th click results in the softest damping fork setting.

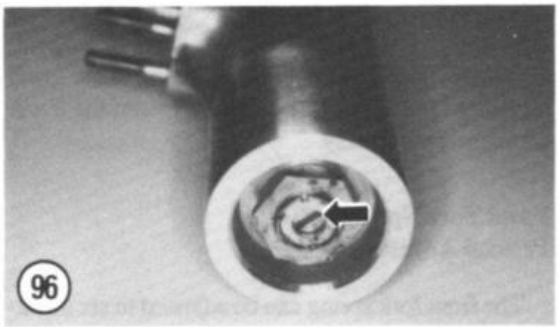


Table 1 FRONT SUSPENSION SPECIFICATIONS

Front wheel	
Rim runout limit	
Radial (up and down)	2.0 mm (0.08 in.)
Lateral (side to side)	2.0 mm (0.08 in.)
Front axle bend limit	0.25 mm (0.01 in.)
Front fork spring length	
Wear limit	
DR250 and DR350	608 mm (23.9 in.)
DR250S and DR350S	602 mm (23.7 in.)
Front fork oil (each leg)	
DR250 and DR350	586 ml (19.8 U.S. oz./20.6 Imp. oz.)
DR250S and DR350S	544 ml (18.4 U.S. oz./19.2 Imp. oz.)
Front fork oil level	
DR250 and DR350	145 mm (5.7 in.)
DR250S and DR350S	170 mm (6.7 in.)

Table 2 FRONT SUSPENSION TIGHTENING TORQUES

Item	N•m	ft.-lb.
Front axle	50-80	36-58
Front axle holder nuts	6-8	4.5-6
Steering stem nut	80-100	58-72.5
Steering adjust nut	40-50	29-36
Handlebar holder bolts	18-28	13-20
Wheel spoke tension	2-4	1.5-3.0
Fork bridge bolts	20-31	14.5-22.5
Front fork		
Top cap bolt	30-40	21.5-29
Damper rod bolt	30-40	21.5-29

CHAPTER ELEVEN

REAR SUSPENSION

This chapter contains repair and replacement procedures for the rear wheel and hub and rear suspension components. Service to the rear suspension consists of periodically checking bolt tightness, replacing swing arm bushings and checking the condition of the spring/gas shock unit. Lubrication of the rear suspension components is covered in Chapter Three.

One U.K. version of the DR350S is equipped with an optional Suzuki Height Control (SHC) system. This system consists of a special hydraulic system that interconnects the rear shock and the front forks and can elevate the bike to two different heights. The rear shock and related hoses on this model are completely different than the rear shock assembly used on all other models covered in this manual. This SHC system is *not* covered in this manual. Consult your local dealer for SHC system service.

Rear suspension specifications are listed in **Table 1. Tables 1-3** are found at the end of the chapter.

REAR WHEEL

Removal

CAUTION

Care must be taken when removing, handling and installing a wheel with a disc brake rotor. The disc rotor is relatively thin in order to dissipate heat and to minimize unsprung weight. The rotor is designed to withstand tremendous rotational loads but can be damaged when subjected to side impact loads. If the rotor is knocked out of true by a side impact a pulsation will be felt in the rear brake pedal when braking. The rotor is too thin to be trued and must be replaced with a new one. Protect the rotor when transporting a wheel to a dealer or tire specialist for tire service. Do ***not*** *place a wheel in a car trunk or pickup*

bed without protecting the rotor from side impact damage.

NOTE

The rear wheel can be removed with the brake caliper still attached to the swing arm. This procedure is shown with the caliper removed for clarity.

1. On models so equipped, remove the axle nut cotter pin (**Figure 1**).
2. Loosen the axle nut (A, **Figure 2**).
3. Support the bike so that the rear wheel is off of the ground.
4. Remove the axle nut (A, **Figure 2**).
5. Remove the right-hand chain adjuster (B, **Figure 2**).
6. Remove the screws securing the drive chain guard (A, **Figure 3**) and remove the guard.
7. Push the wheel forward to provide as much chain slack as possible. Then turn the rear wheel and derail the drive chain off of the driven sprocket.
8. Remove the axle and chain adjuster (B, **Figure 3**) from the left-hand side. Don't loose the collar on each side of the hub.

NOTE

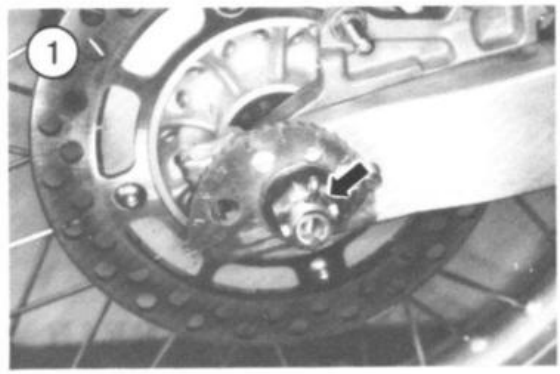
After removing the rear wheel in Step 9, insert a piece of wood or hose in the caliper between the brake pads. That way, if the brake pedal is accidentally applied, the piston will not be forced out of the brake caliper cylinder. If the brake pedal is applied and the piston comes out, the caliper might have to be disassembled to reseat the piston and the system will have to be bled.

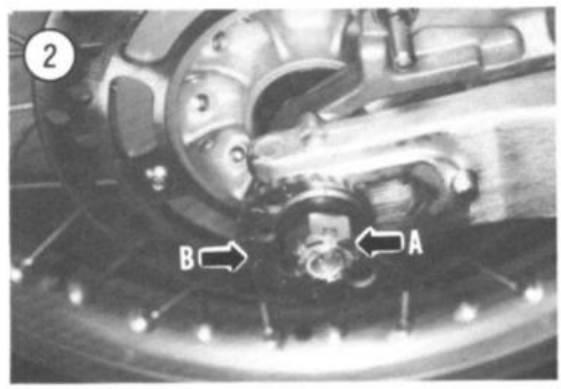
9. Pull the wheel back and disengage the brake disc from the rear caliper assembly and remove the rear wheel (**Figure 4**).

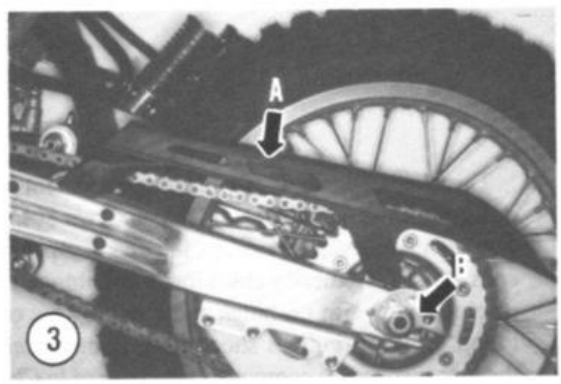
CAUTION

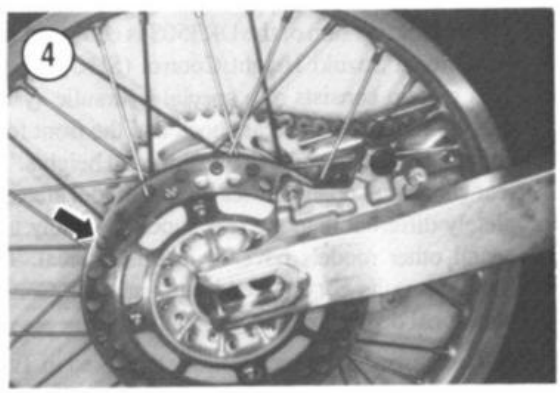
*Do **not** set the wheel down on the disc surface as it may get scratched or warped. Set the tire sidewalls on 2 wood blocks as shown in **Figure 5**.*

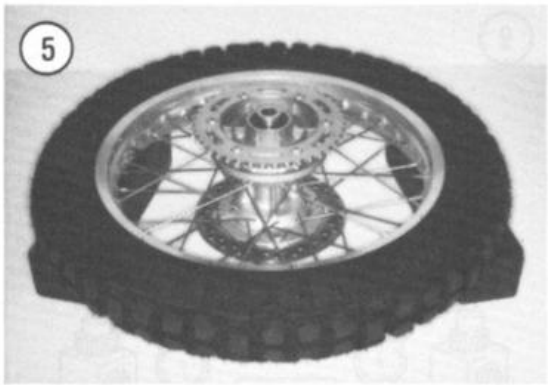
10. Install the axle adjusters and the axle nut on the axle (**Figure 6**) to prevent their accidental loss when servicing the wheel.
11. Inspect the wheel spokes as described under *Wheel Spoke Service* in Chapter Ten.
12. Inspect the hub as described in this chapter.

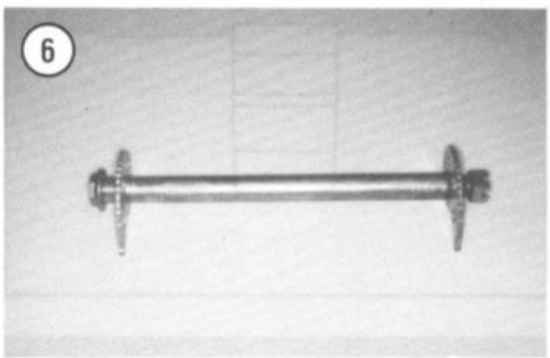


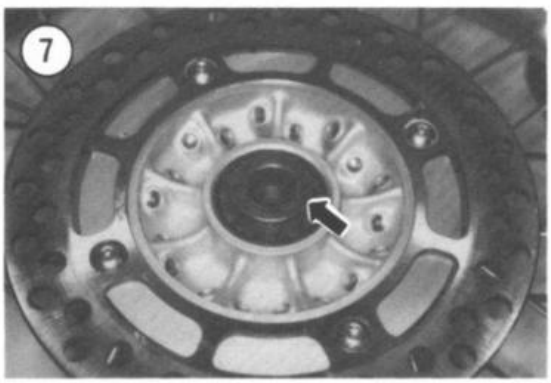


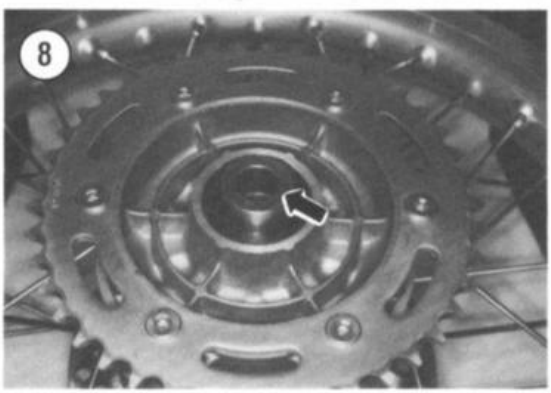












Installation

1. Clean the axle, axle spacers and chain adjusters in solvent and thoroughly dry. Make sure all axle contact surfaces are clean and free of dirt and old grease prior to installation. If these surfaces are not cleaned, the axle may be difficult to install.
2. Apply a light coat of grease to the axle and to the rear hub bearings and grease seals.
3. Make sure the right- (**Figure 7**) and left-hand (**Figure 8**) axle spacers are installed on the hub.
4. Remove the piece of wood or hose from the caliper.
5. Correctly position the rear wheel into the rear of the swing arm and carefully insert the disc between the brake pads, install the wheel and push it forward. Don't damage the leading edges of the brake pads.
6. Engage the drive chain onto the driven sprocket.
7. Install the left-hand axle adjuster onto the rear axle and install the rear axle from the left-hand side (**Figure 3**).
8. Install the right-hand axle adjuster (B, **Figure 2**) and the rear axle nut (A, **Figure 2**). Tighten the nut only finger-tight at this time.
9. Adjust the drive chain as described under *Drive Chain Adjustment* in Chapter Three and tighten the axle nut (A, **Figure 2**) to the torque specification in **Table 2**.
10. On models so equipped, secure the axle nut with a *new* cotter pin (**Figure 1**). Bend the end of the cotter pin over to lock it.
11. After the wheel is completely installed, rotate it several times to make sure it rotates smoothly. Apply the rear brake several times to make sure it operates correctly.

WHEEL SPOKE SERVICE

Wheel spoke service is covered in Chapter Ten.

REAR HUB

Inspection

1. Visually check the rear axle surface for cracks, deep scoring or excessive wear. Check axle runout with a set of V-blocks and dial indicator (**Figure 9**). The maximum allowable bend is listed in **Table 1**. If you do not have access to the special tools, roll the axle on a flat surface (e.g. piece of plate glass). If

you hear a "clicking" sound that indicates the axle has a slight bend to it. Replace a bent axle. Do not attempt to straighten it.

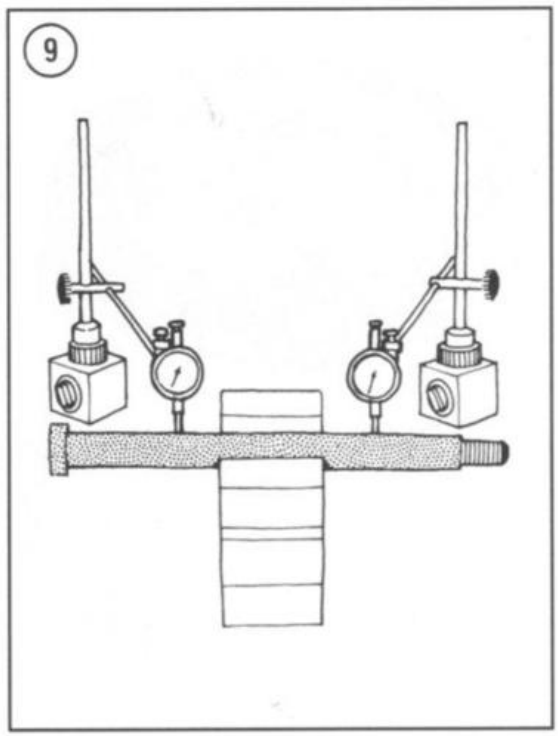
2. If still installed, remove both axle spacers (A, **Figure 10**) from the hub.

3. Check the oil seals (B, **Figure 10**) for signs of wear, cracks or other damage. A damaged oil seal will allow bearing contamination. Replace the oil seal as described in this section.

4. In the rear hub, turn the inner bearing race by hand and check for any sign of roughness or damage. If necessary, replace the bearings, as a set, as described in this section.

5. Check the driven sprocket bolts (**Figure 11**) for tightness. If loose, tighten the bolts securely.

6. Check the bolts (A, **Figure 12**) securing the brake disc (B, **Figure 12**) for tightness. If loose, tighten the bolts to the torque specification listed in **Table 2**.

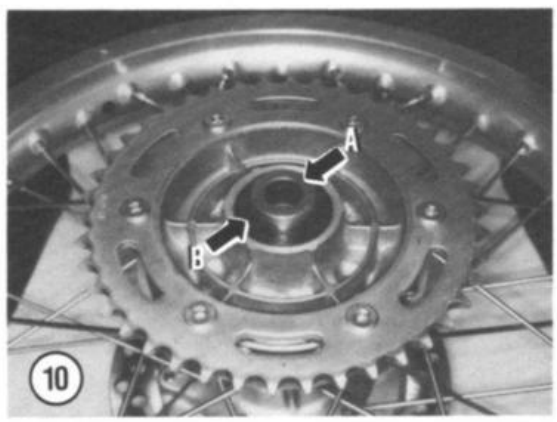


Inspection/Disassembly

Refer to **Figure 13** for this procedure.

CAUTION

Do not remove the wheel bearings for inspection purposes as they will be damaged during the removal process. Remove wheel bearings only if they are to be replaced.



1. Remove the rear wheel as described in this chapter.

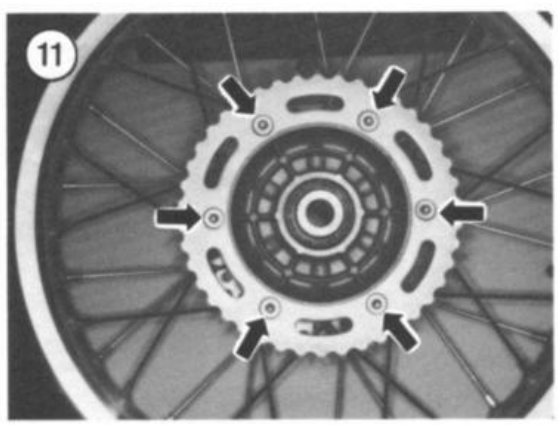
2. If still installed, remove both axle spacers (A, **Figure 10**) from the hub.

3. To remove the oil seal (B, **Figure 10**) from the hub, perform the following:

   a. Remove the oil seal by carefully prying it out of the rear hub with a long screwdriver.
   b. Lift the screwdriver and work it around the seal every few degrees until it pops out of the driven flange.
   c. Prop a piece of wood or rag underneath the screwdriver to prevent damaging the driven flange.

NOTE

When replacing the bearings, be sure to take your old bearings along to ensure a perfect matchup.



4. Turn the inner race of each bearing by hand. Make sure bearings turn smoothly and check for any signs

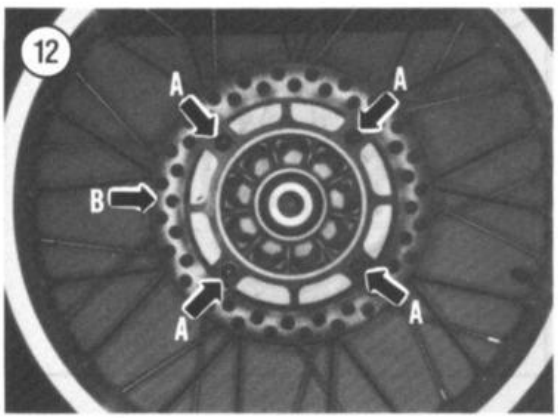
of roughness or damage. Replace the hub bearings as a complete set if they are noisy or have excessive play.

5. On non-sealed bearings, check the rollers or balls for evidence of wear, pitting or excessive heat (bluish tint). Replace the bearings if necessary.

6. To remove the left- and right-hand hub bearings and spacer, perform the following:

a. Insert a soft aluminum or brass drift into the right-hand side of the hub.

b. Push the middle spacer over to one side and place the drift on the inner race of the lower single right-hand bearing (**Figure 14**).



c. Tap the bearing out of the hub with a hammer, working around the perimeter of the inner race.

d. Remove the middle spacer.

e. Repeat for the 2 bearings on the left-hand side.

7. Thoroughly clean out the inside of the hub with solvent and dry with compressed air or a shop cloth.

Assembly

Since there are 2 bearings on the sprocket side (left-hand side) of the hub it is suggested that the special Suzuki bearing installation tools be used for installing the bearings. The special tools are, 2 bearing installers (part No. 09924-84510 and No. 09924-84521) and are available from Suzuki dealers.

1. Blow any dirt or foreign matter out of the hub prior to installing the bearings.

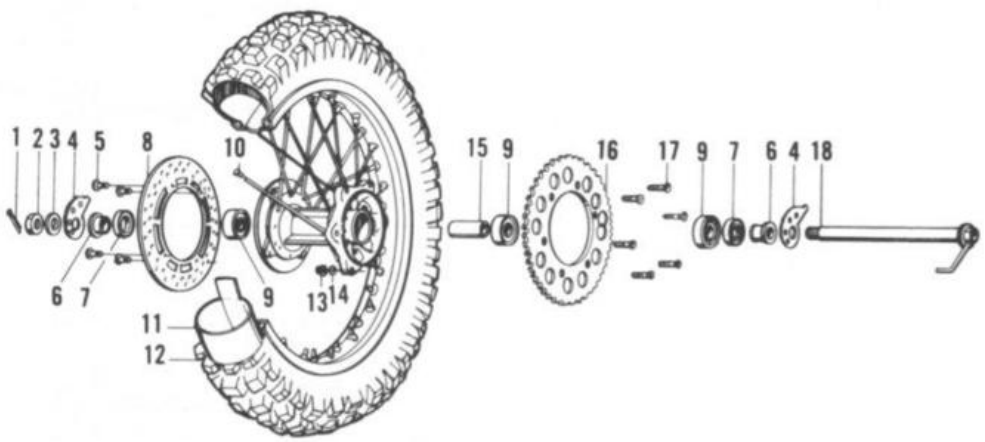
NOTE

Fully sealed bearings are available from many good bearing specialty shops. Fully sealed bearings provide better protection from dirt and moisture that may get into the hub.

2. Pack non-sealed bearings with good quality bearing grease. Work the grease in between the balls thoroughly. Turn the bearing by hand a couple of

11

13 **REAR WHEEL**



1. Cotter pin
2. Axle nut
3. Washer
4. Chain adjuster
5. Bolt
6. Right-hand spacer
7. Oil seal
8. Brake disc
9. Bearing
10. Spoke nipple
11. Inner tube
12. Tire
13. Nut
14. Washer
15. Spacer
16. Rear driven sprocket
17. Bolt
18. Axle

times to make sure the grease is distributed evenly inside the bearing.

3. Place the new wheel bearing outer races in a freezer if possible. Chilling them will slightly reduce their overall diameter. This will make installation easier.

4. Pack the wheel hub and spacer with multipurpose grease.

NOTE

If a bearing has only one sealed side, install the bearing with the sealed side facing out.

CAUTION

*If the special tools are not used, when installing the bearings in the following procedures, tap the bearings squarely into place and tap on the outer race only. Use a socket (**Figure 15**) that matches the outer race diameter. Do not tap on the inner race or the bearing will be damaged. Be sure that the bearings are completely seated.*

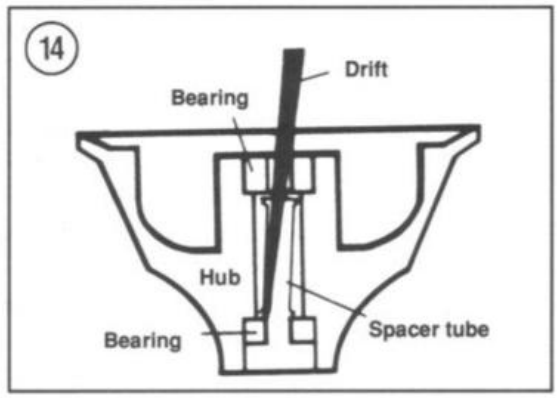
5. First install the left-hand bearings as follows:
   a. Install the special tool (A, **Figure 16**) into the hub.

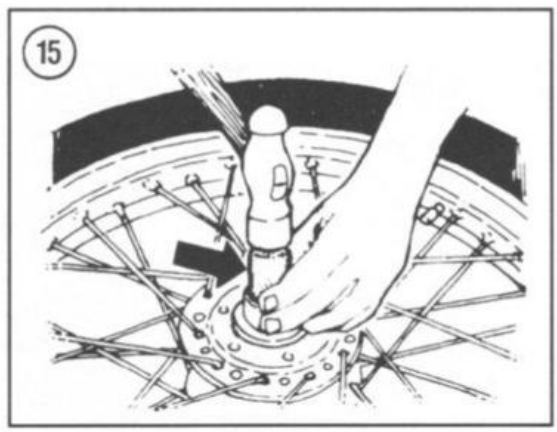
NOTE

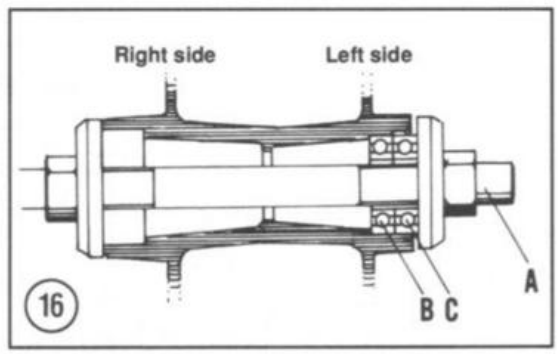
*The inner bearing has a slightly smaller outer diameter. The **old** removed inner bearing is to be used to install the inner bearing into the deep receptacle in the hub.*

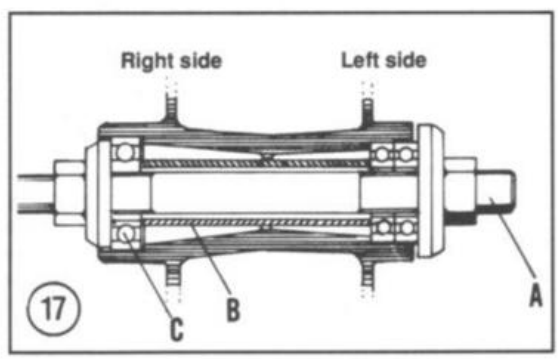
   b. Install the inner left-hand bearing (B, **Figure 16**) and old inner bearing (used as a spacer). Pull the bearing into the hub until it bottoms out in the hub.
   c. Remove the special tool and the old spacer bearing.
   d. Install the outer left-hand bearing (C, **Figure 16**) and pull it into the hub until it bottoms out in the hub.
   e. Remove the special tool.

6. Install the right-hand bearing as follows:
   a. Install the special tool (A, **Figure 17**) and spacer (B, **Figure 17**) into the hub.
   b. Install the right-hand bearing (C, **Figure 17**) into the hub and pull it in until it bottoms out in the hub.
   c. Remove the special tool.









7. Install the oil seal into each side of the hub.
8. Install the rear wheel as described in this chapter.

SPROCKETS

This procedure describes service to the front drive and the rear driven sprockets.

Front Drive Sprocket Removal/Installation

1. Remove the screws securing the drive sprocket cover (**Figure 18**) and remove the cover and the drive chain guide plate.
2. Remove the circlip securing the drive sprocket (A, **Figure 19**). Discard the circlip as a new one must be installed.
3. Slide the drive sprocket and drive chain (B, **Figure 19**) off the transmission countershaft.

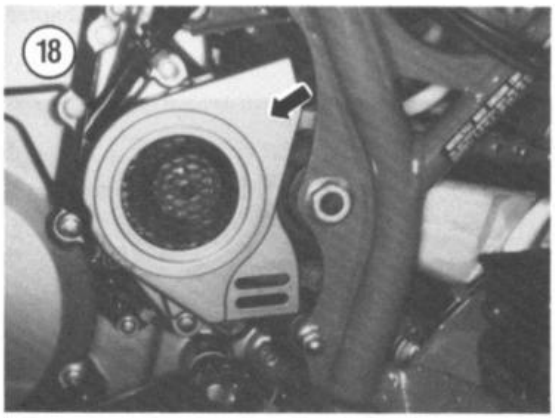
NOTE

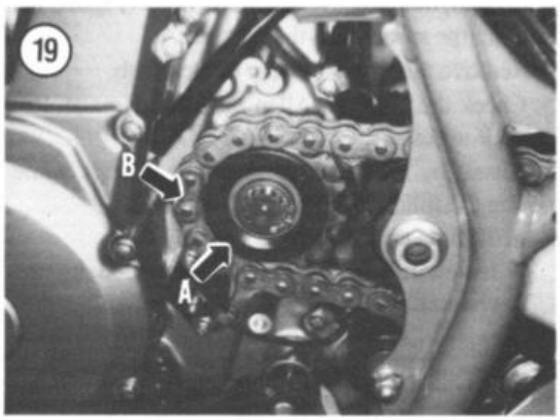
*If the drive chain is tight, remove the cotter pin (models so equipped), loosen the rear axle nut (A, **Figure 2**), then loosen the chain adjusters (B, **Figure 2**) and push the rear wheel forward.*

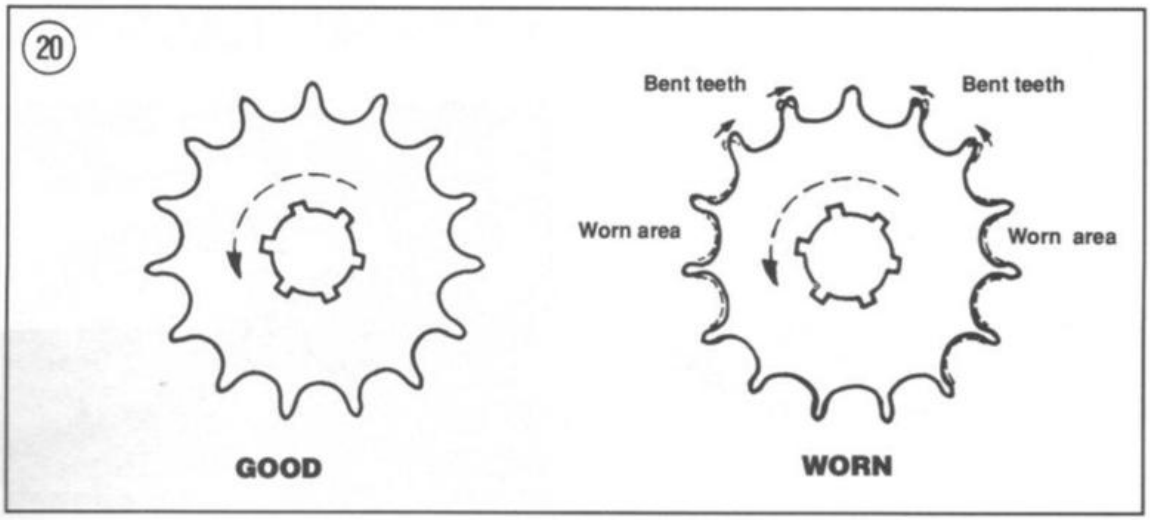
NOTE

*If the drive sprocket requires replacement, the drive chain is probably worn also and may need replacement. Refer to **Drive Chain Inspection** in Chapter Three. Also inspect the driven sprocket as described in this chapter.*

4. Inspect the sprocket teeth. If they are visibly worn (**Figure 20**), replace the sprocket.
5. Install by reversing these removal steps while noting the following:
   a. Install a *new* circlip and make sure it seats correctly in the countershaft groove.







b. If the rear wheel axle nut was loosened, adjust the drive chain as described in Chapter Three.

Rear Driven Sprocket Removal/Installation

Refer to **Figure 13** for this procedure.

1. Remove the rear wheel as described in this chapter.

NOTE

*If the driven sprocket requires replacement, the drive chain is probably worn also and may need replacement. Refer to **Drive Chain Inspection** in Chapter Three. Also inspect the drive sprocket as described in this chapter.*

2. Inspect the sprocket teeth (**Figure 21**) for wear or damage. If they are visibly worn (**Figure 20**), replace the driven sprocket.
3. Loosen, then remove the Allen bolts (**Figure 11**) holding the sprocket to the rear hub.
4. Remove the sprocket from the rear hub.
5. Check the sprocket Allen bolts for damage. Replace if necessary.
6. Install by reversing these removal steps while noting the following:
   a. Tighten the Allen bolts securely.
   b. Install the rear wheel as described in this chapter.

DRIVE CHAIN

Removal/Installation

WARNING

*The original equipment Suzuki drive chain is manufactured as an endless loop with no master link. Do **not** cut it with a chain cutter as this will result in future chain failure and possible loss of control under riding conditions.*

NOTE

If an aftermarket drive chain has been installed it may be equipped with a master link. Follow the chain manufacturer's instructions for removal.

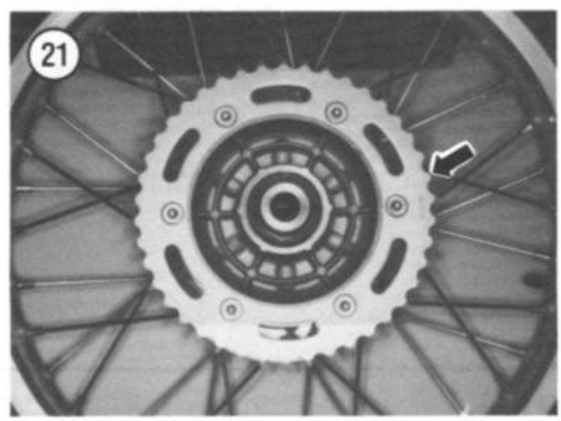
1. Remove the drive sprocket as described in this chapter.
2. Remove the swing arm as described in this chapter.
3. Remove the drive chain from the swing arm.
4. Install by reversing these removal steps while noting the following:
   a. Be sure to install the drive chain (**Figure 22**) over the front of the swing arm prior to installing the swing arm.
   b. Adjust the drive chain as described in Chapter Three.

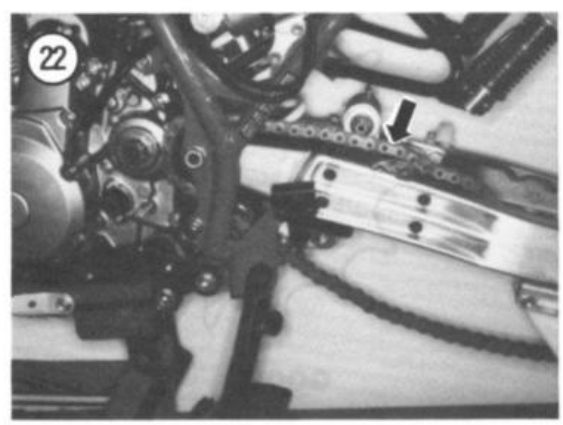
Service and Inspection

For service and inspection of the drive chain, refer to *Periodic Lubrication* and *Periodic Maintenance* in Chapter Three.

TIRE CHANGING AND TIRE REPAIRS

Tire changing and repair is covered in Chapter Ten.





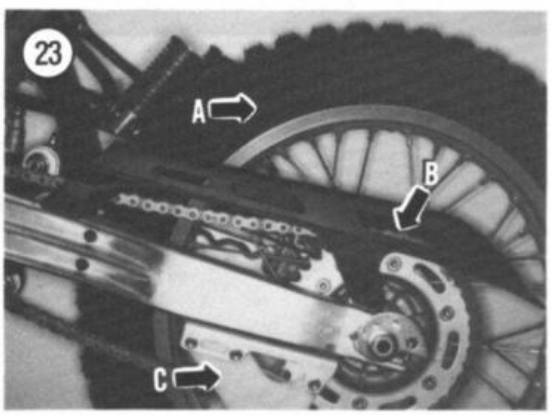
REAR SUSPENSION

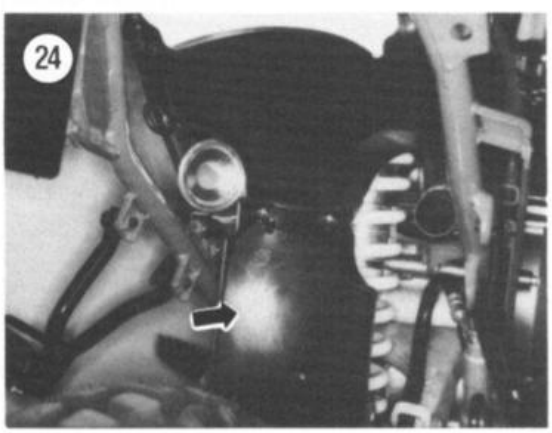
All models use a single rear shock absorber/spring unit. The single shock controls swing arm movement through a compound linkage system with bearings at both ends of the vertical relay arm and lever arm.

The single shock/spring unit eliminates the requirement for periodic inspection for equal damping and spring tension between dual shocks. However, several suspension bushings carry a great amount of load and frequent lubrication and wear inspections are necessary to preserve good handling and prevent premature component wear. Grease fittings are provided at the strategic places.

NOTE

The procedures within this section do ***not*** *relate to the U.K. version of the DR350S that is equipped with an optional Suzuki Height Control system. This system is not covered in this manual as noted at the beginning of this chapter.*





The following procedures are shown removing the rear suspension assembly as a complete unit. The swing arm is removed with the shock absorber and shock linkage still attached to it. The swing arm can be removed with or with out the shock linkage and shock absorber attached to it, but the individual component removal of the shock absorber and/or the shock linkage is very difficult to accomplish with the swing arm still installed due to lack of work room within the chassis. It easier to remove and install as an entire assembly and disassemble the components, than to try to remove the separate components.

Rear Suspension Assembly Removal/Installation

1. Remove the seat and both frame side covers as described in Chapter Thirteen.
2. Remove the rear wheel (A, **Figure 23**) as described in this chapter.
3. Remove the drive chain guard (B, **Figure 23**) and guide (C, **Figure 23**) from the swing arm.
4. Before removing the swing arm pivot shaft nut, check swing arm side play as follows.
   a. Grasp the swing arm at the rear and hold it in a horizontal position.
   b. Check swing arm side play by moving the swing arm from side to side. There should be no noticeable side play.
   c. Check swing arm movement by moving it up and down. The swing arm should move smoothly with no tightness or binding.
   d. If the swing arm moved abnormally during this test, replace the swing arm bearings as described in this chapter.
5. Remove the rear brake caliper and brake hose from the swing arm. Refer to Chapter Twelve.
6. Remove the screws securing the rear fender mudguard (**Figure 24**) and remove the mudguard.
7. Remove the clamping band screws securing the shock absorber reservoir tank (**Figure 25**) and slide the bands off the mounting bracket.
8. Remove the shock absorber upper mounting bolt (**Figure 26**) and nut securing the shock absorber to the frame.

9. Remove the bolt, nut and washers securing the drive chain roller (**Figure 27**) to the frame. Don't lose the washer on each side of the roller. Reinstall the roller, washers and nut onto the bolt to avoid misplacing them.

10. Remove the bolt and nut securing the relay arm to the frame mounting tabs (**Figure 28**).

11. Remove the pivot shaft nut and washer (**Figure 29**).

12. Have an assistant hold onto the swing arm or place a box under it to support it after the pivot shaft is removed.

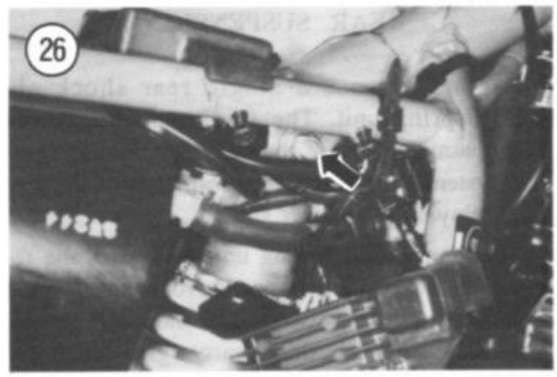
13. Push the pivot shaft out from the right-hand side. If the pivot shaft is tight, use an aluminum or brass drift and tap the pivot shaft out of the left-hand side.

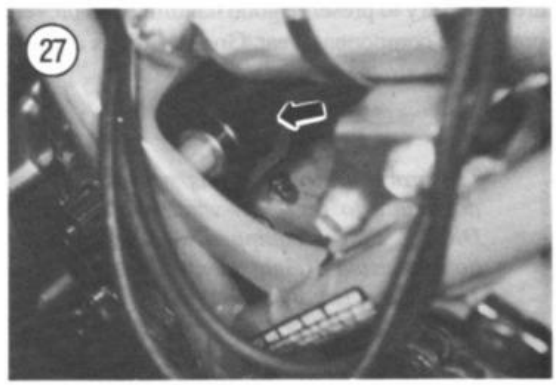
NOTE

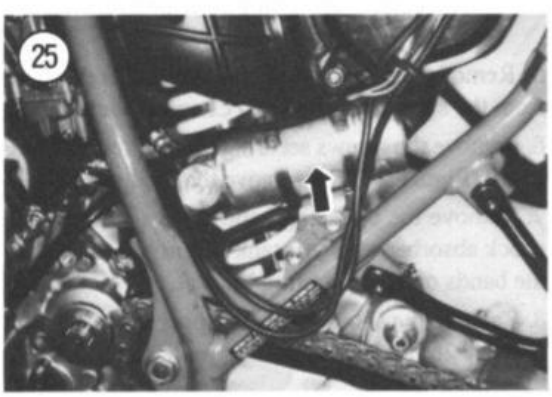
If the pivot shaft is real tight, try to push it out far enough so that its bolt head on the left end is clear of the frame. Then use an adjustable wrench on the end of the pivot shaft and turn the shaft back and forth to help break it loose. Continue to remove the pivot shaft with the brass or aluminum drift. If necessary, spray WD-40 into the pivot shaft hole in the swing arm and let it set for 15-30 minutes.

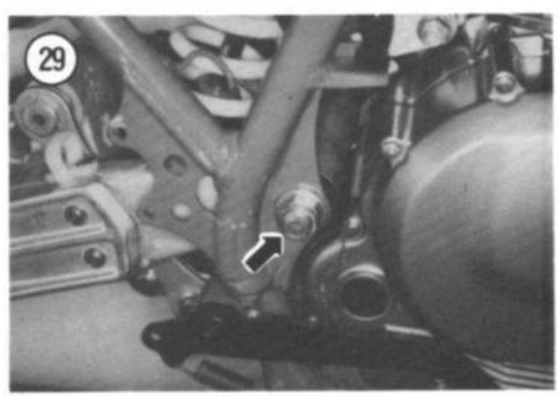
14. Move the swing arm toward the rear, along with the drive chain and away from the frame. Carefully guide the shock absorber and reservoir out through the frame and remove the assembly. Don't loose the dust covers and washers, as they may fall off during removal (**Figure 30**).

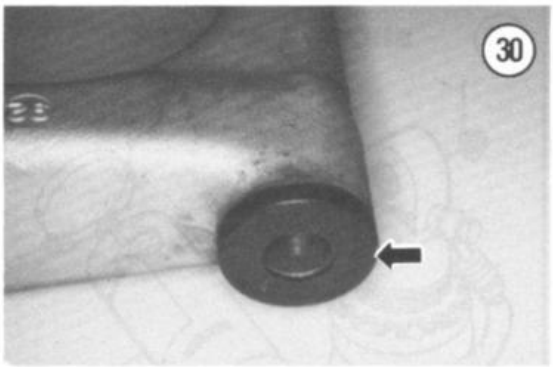
15. Inspect the swing arm, bearings and spacer as described in this chapter. Remove the shock absorber and shock linkage if necessary as described in this section.

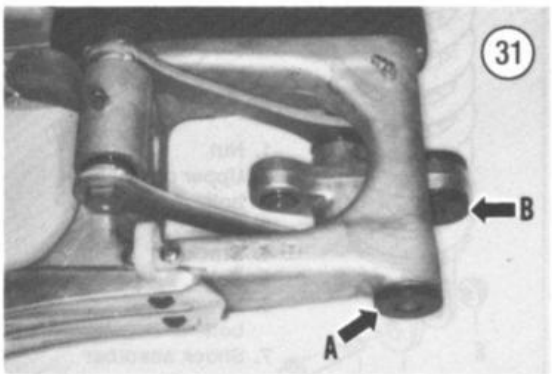


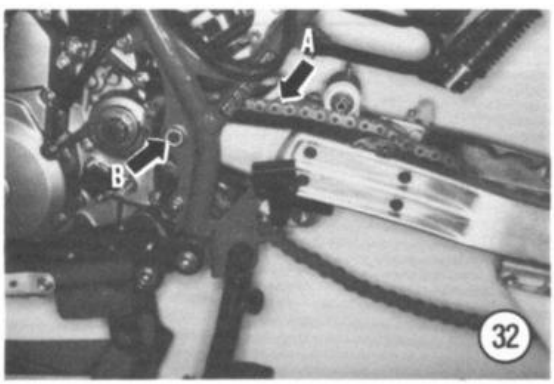


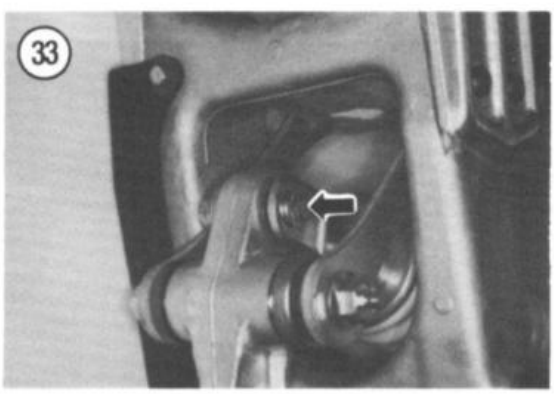












16. Installation is the reverse of these steps while noting the following:

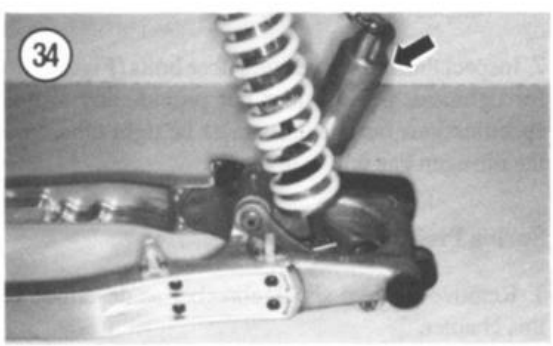
a. Apply molybdenum disulfide grease onto the bushing and onto the exterior of the pivot shaft.
b. Make sure the dust seals are in place on the swing arm (A, **Figure 31**) and relay arm (B, **Figure 31**) pivot points prior to installation in the frame.
c. Tighten the swing arm pivot shaft nut to the torque specification listed in **Table 2**.
d. Tighten the upper shock absorber bolt and nut to the torque specification listed in **Table 2**.
e. Be sure to link the drive chain over (A, **Figure 32**) the swing arm prior to installing the swing arm pivot shaft and nut (B, **Figure 32**).
f. Adjust the drive chain as described under *Drive Chain Adjustment* in Chapter Three.

SHOCK ABSORBER

Removal/Installation

1. Remove the rear suspension assembly as described in this chapter.
2. Remove the lower mounting bolt and nut (**Figure 33**) securing the lower end of the shock absorber to the lever arm and remove the shock absorber.
3. Inspect the shock absorber as described in this chapter.
4. Installation is the reverse of these steps while noting the following:

a. Apply molybdenum disulfide grease onto the bolt and lower mounting tabs of the shock absorber.
b. Position the shock absorber with the reservoir hose outlet toward the front and with the reservoir on the left-hand side (**Figure 34**).



c. Tighten the lower mounting bolt and nut to the torque specification listed in **Table 2**.

Shock Absorber
Inspection

Refer to **Figure 35** for this procedure.

NOTE

The shock absorber cannot be disassembled nor rebuilt; it must be replaced as an assembly.

1. Inspect the upper mount collar (**Figure 36**) for galling, cracks or other damage, replace if necessary.
2. Inspect the shock absorber lower mount holes (**Figure 37**) for elongation, cracks or other damage. If damaged, replace the shock absorber assembly.
3. Inspect the spring (A, **Figure 38**) for cracks or damage. If damaged, replace the shock absorber assembly.
4. Check the lower spring seat (B, **Figure 38**) for cracks or looseness. If damaged, replace the shock absorber assembly.
5. Check the damper unit (C, **Figure 38**) for oil leakage. If there is any type of leakage, replace the shock absorber assembly.
6. Inspect the rubber stopper (D, **Figure 38**) for deterioration or damage. If damaged, replace the shock absorber assembly.

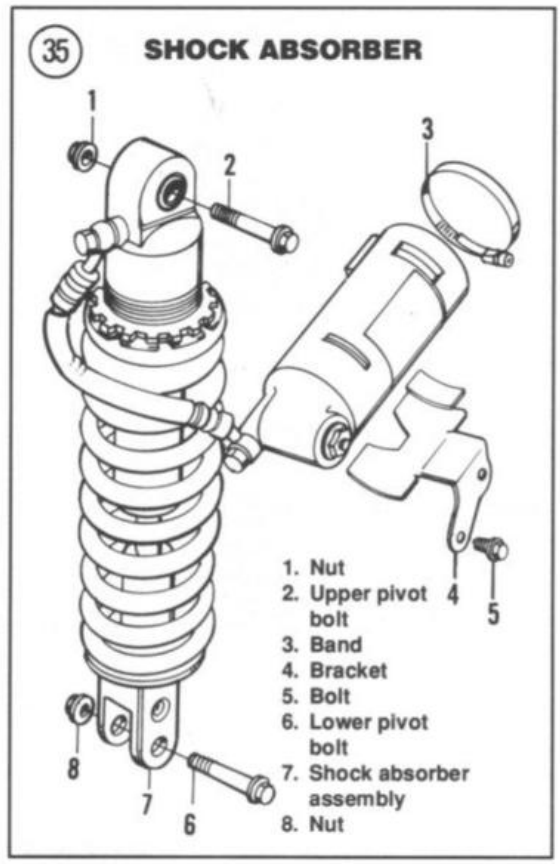
WARNING

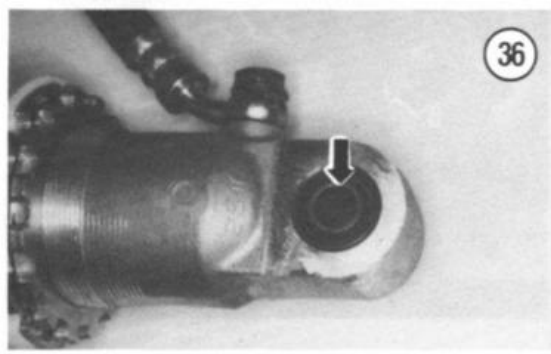
*The shock absorber and remote reservoir contain highly compressed nitrogen gas. Do not tamper with or attempt to open the cylinder (**Figure 39**). Do not place it near an open flame or other extreme heat. Do not weld on the frame near it. Do not dispose of the shock absorber yourself. Take it to a Yamaha dealer where it can be deactivated and disposed of properly.*

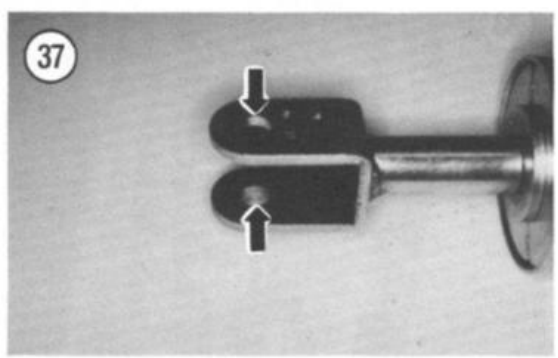
7. Inspect the interconnecting hose bolts (**Figure 40**) for tightness. Suzuki does not provide any torque specifications but the bolts must be tight otherwise the nitrogen gas will leak out.

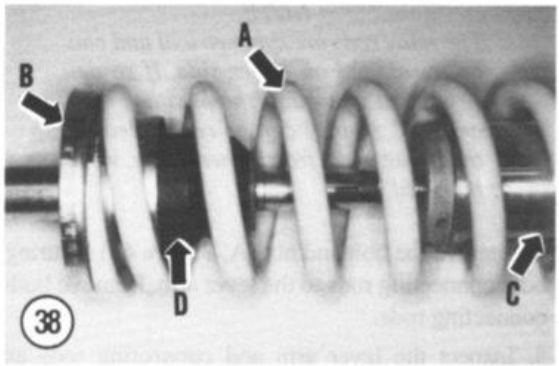
Spring Preload Adjustment

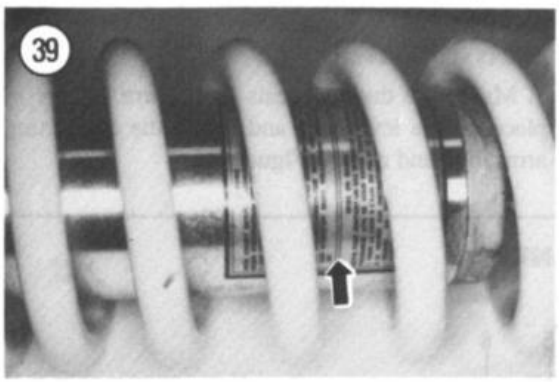
1. Remove the rear shock absorber as described in this chapter.

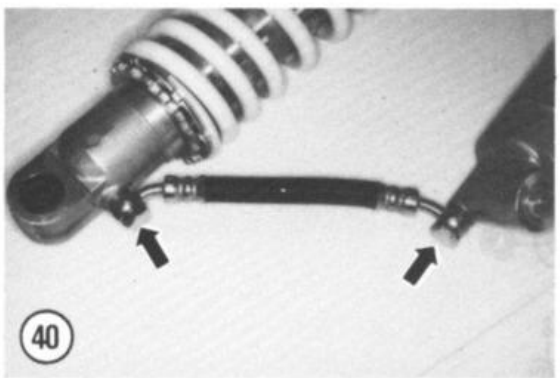


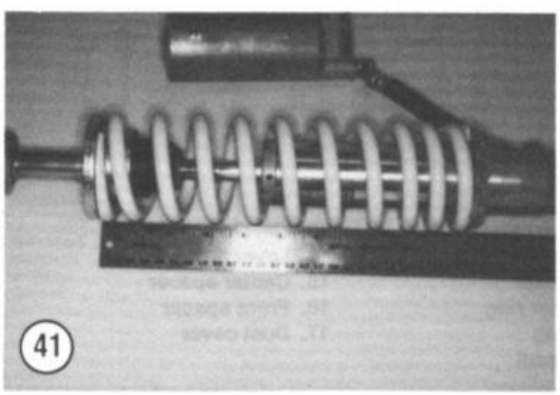












2. Measure the existing length of the spring (**Figure 41**).

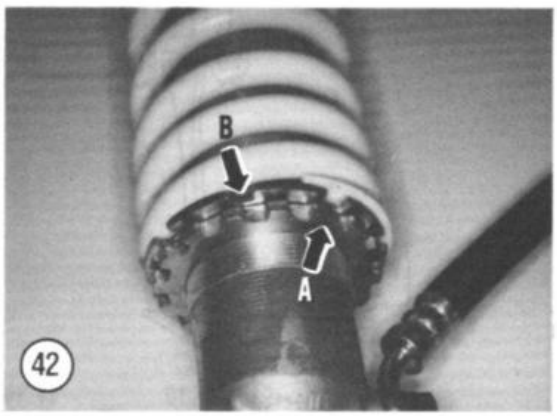
3. If adjustment is necessary, perform the following:
   a. Using the spanner wrench provided in your bike's tool kit, slowly loosen the spring locknut (A, **Figure 42**).
   b. Turn the spring adjuster (B, **Figure 42**) to obtain the desired spring preload within the minimum and maximum limits specified in **Table 3**.

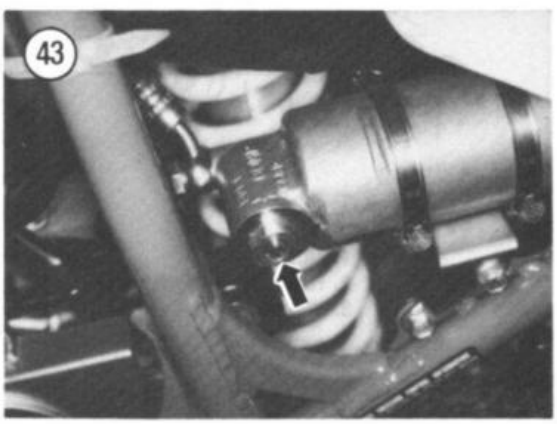
4. Tighten the locknut securely.

Rebound Damping Adjustment

1. Rebound damping adjustment is made by turning the rebound adjuster at the front of the reservoir (**Figure 43**).

2. To make rebound damping stiffer, use a screwdriver and turn the adjuster *clockwise* as viewed from the left-hand side of the bike. Turn the adjuster *counterclockwise* to soften rebound damping.





NOTE

When turning the adjuster, make sure it clicks into position. Otherwise the adjuster will automatically be set in the stiffest position.

SHOCK LINKAGE

Removal/Installation

Refer to **Figure 44** for this procedure.

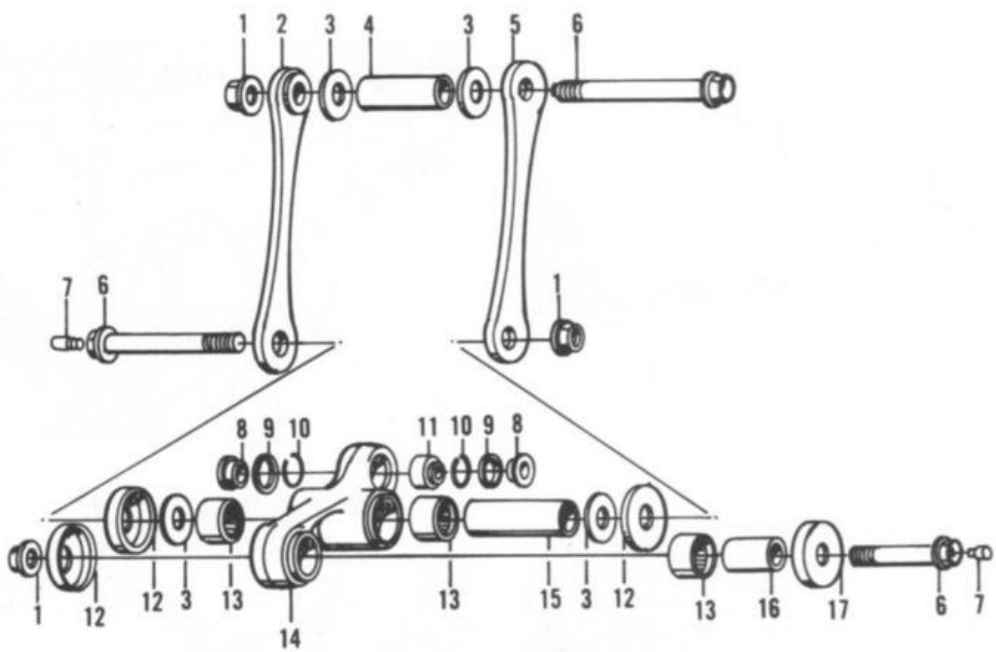
1. Remove the rear suspension assembly as described in this chapter.
2. Remove the shock absorber from the swing arm as described in this chapter.
3. Remove the bolt and nut (**Figure 45**) securing the relay arms to the swing arm and remove the relay arms and lever arm assembly.

NOTE

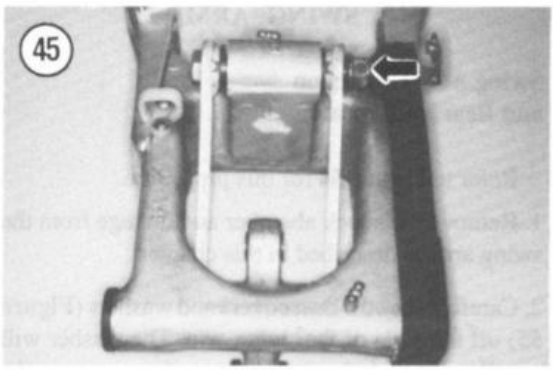
The relay rods are symmetrical and can be reinstalled on either side. If so desired, you can mark them with a "L" and "R" so they can be reinstalled on the same side from where they were removed.

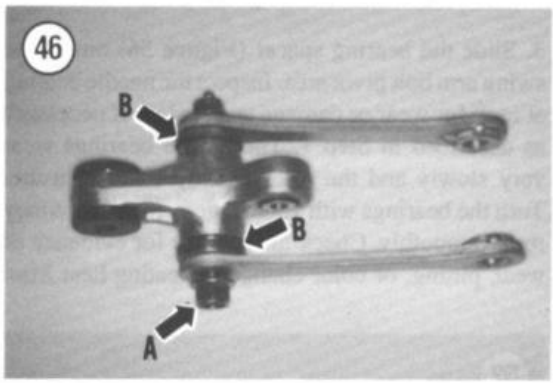
4. Remove the bolt and nut (A, **Figure 46**) securing both connecting rods to the lever arm. Remove both connecting rods.
5. Inspect the lever arm and connecting rods as described in this chapter.
6. Apply molybdenum grease to all pivot bolts, collars and dust seals.
7. Make sure the dust seals (B, **Figure 46**) are in place on the lever arm and install the connecting arms, bolt and nut (A, **Figure 46**).

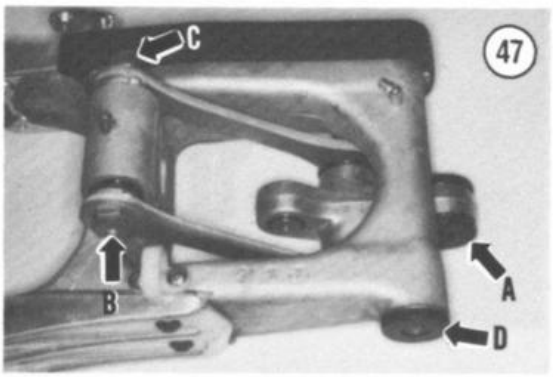
(44) **SHOCK LINKAGE**

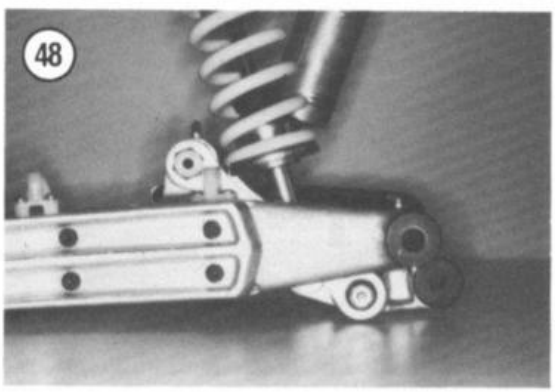


1. Nut
2. Relay arm—right hand
3. Washer
4. Spacer
5. Relay arm—left hand
6. Pivot bolt
7. Grease fitting
8. Spacer
9. Dust seal
10. Stopper ring
11. Bearing
12. Dust seal
13. Needle bearing
14. Lever arm
15. Center spacer
16. Front spacer
17. Dust cover









CAUTION

The lever arm must be positioned as shown in order to connect correctly with the shock absorber and the frame mounting boss.

8. Correctly position the lever arm with the long end that is equipped with the dust seals (A, **Figure 47**) toward the front. Install the lever arm and the connecting rod assembly onto the swing arm. Insert the bolt (B, **Figure 47**), then install the nut (C, **Figure 47**) and tighten finger-tight at this time.

9. Install the shock absorber onto the relay arm as described in this chapter.

10. After all components have been installed onto the swing arm, refer to **Figure 48**. This is how the assembled components should look. If the relay arm is installed backwards, correct this situation at this time.

11. Tighten all bolts and nuts to the torque specification listed in **Table 2**. Move the shock absorber up and down to make sure there is no binding within all components.

12. Install the swing arm assembly as described in this chapter.

Inspection

The lever arm is equipped with needle bearings. The bearings wear very slowly and the wear is difficult to measure.

1. Inspect the connecting rods (**Figure 49**) for wear, damage or distortion. Replace the connecting rods as a pair even if only one requires replacement.

2. Remove the dust seals (**Figure 50**) from the relay arm.

3. Inspect the lever arm (**Figure 51**) for cracks, damage and wear. Replace if any cracks or surface damage is evident.

4. Remove the front spacer (A, **Figure 52**) and center spacer (B, **Figure 52**) from the relay arm. Inspect the spacer for wear or damage and replace if necessary.

5. Inspect the needle bearings in the relay arm as follows:

a. Turn the bearings (**Figure 53**) with your fingers. Make sure they rotate smoothly.

b. Check the needles for evidence of wear, pitting, or color change indicating heat from lack of lubrication. In severe instances, the needles will fall out of the bearing cage.

c. If necessary, have the bearings replaced by a machine shop or dealer as a press is required for both removal and installation.

SWING ARM

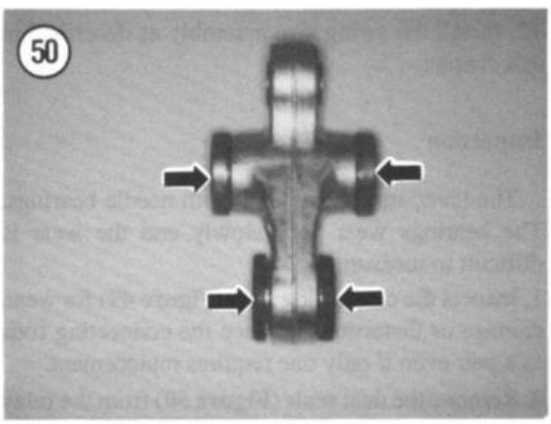
Swing Arm Inspection and Bearing Replacement

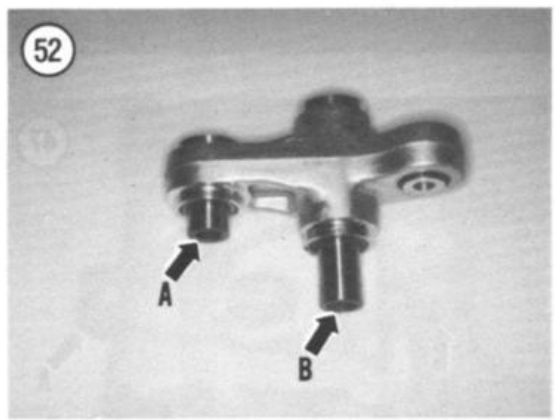
Refer to **Figure 54** for this procedure.

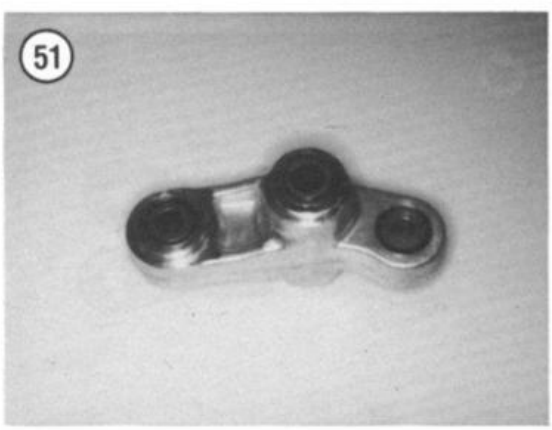
1. Remove the shock absorber and linkage from the swing arm as described in this chapter.

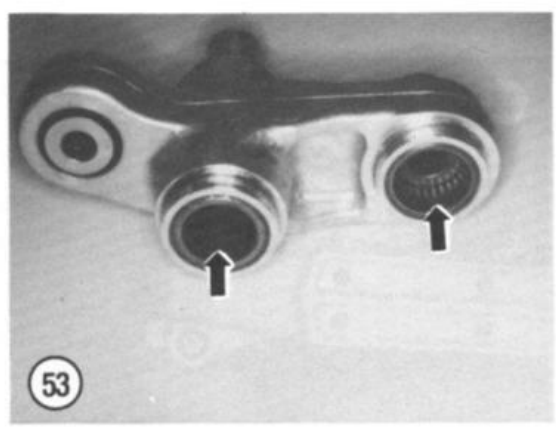
2. Carefully pry the dust covers and washers (**Figure 55**) off the ends of the swing arm. The washer will usually stay with the thrust cover, if not remove the washer from the ends of the swing arm.

3. Slide the bearing spacer (**Figure 56**) out of the swing arm bolt pivot area. Inspect the needle bearing at each for wear or damage and replace if necessary as described in Step 7. The needle bearings wear very slowly and the wear is difficult to measure. Turn the bearings with your fingers. Make sure they rotate smoothly. Check the needles for evidence of wear, pitting, or color change indicating heat from









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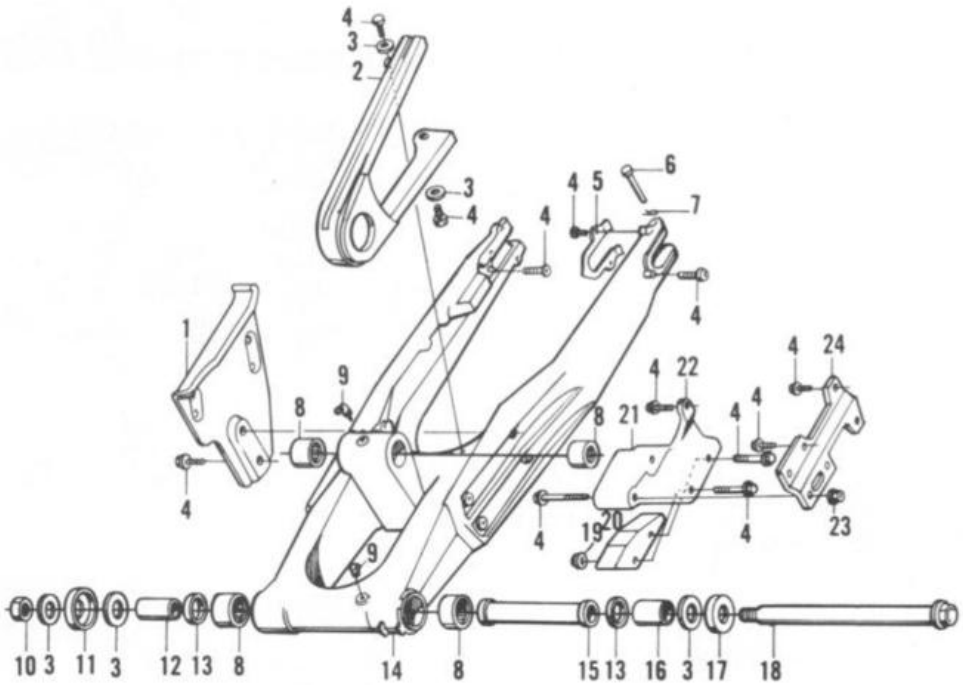
SWING ARM



1. Drive chain guard
2. Drive chain buffer
3. Washer
4. Bolt
5. Adjuster plate
6. Pin
7. Clip
8. Needle bearing
9. Grease fitting
10. Nut
11. Dust cover
12. Bearing spacer
13. Oil seal
14. Swing arm
15. Center pivot spacer
16. Bearing spacer
17. Dust cover
18. Pivot bolt
19. Nut
20. Drive chain slipper
21. Drive chain guide
22. Tab
23. Nut
24. Drive chain guide bracket

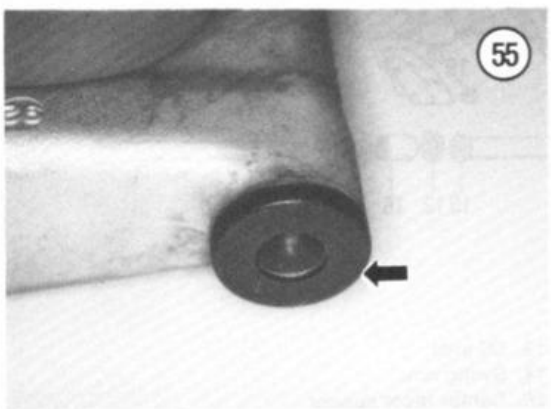
lack of lubrication. In severe instances, the needles will fall out of the bearing cage.

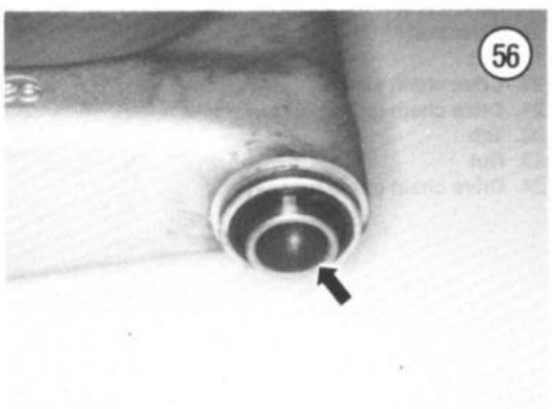
4. Remove the spacer (**Figure 57**) from the connecting rod pivot area of the swing arm. Inspect the spacer for wear or damage and replace if necessary.

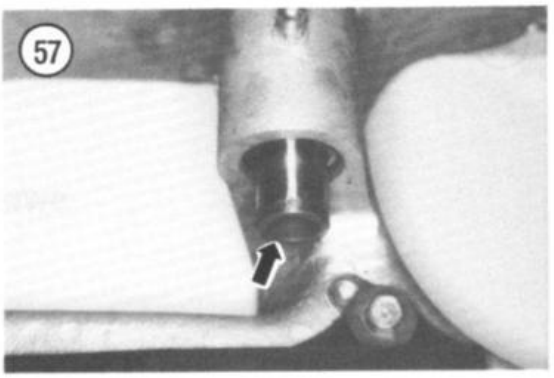
5. Inspect the needle bearings (**Figure 58**) in the connecting rod pivot area of the swing arm and replace them if necessary as described in Step 7 of this procedure.

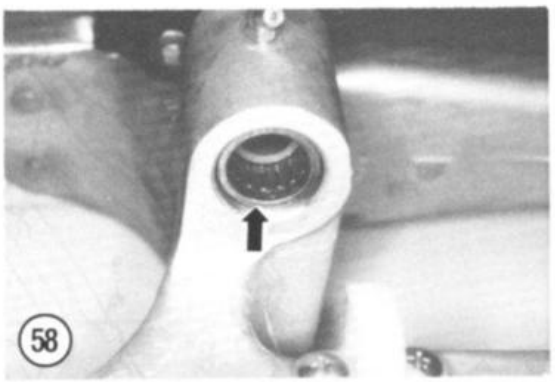
6. Inspect the swing arm for cracks, twisting, weld breakage or other damage. Refer to **Figure 59** and **Figure 60**. Refer repair to a competent welding shop or if damage is severe, replace the swing arm.

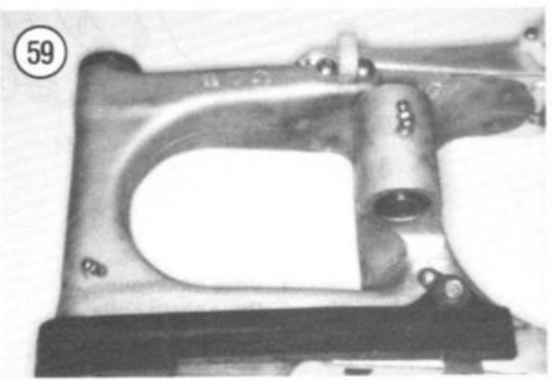
7. Replace the bearings as follows:
   a. Using a long metal rod or drift punch, tap one of the bearings out of the swing arm.
   b. Remove the opposite bearing in the same manner.
   c. Clean the swing arm bearing bore with solvent and allow to dry.
   d. Lubricate the bearings with oil before installation.

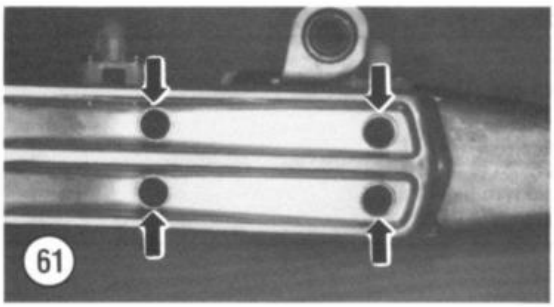


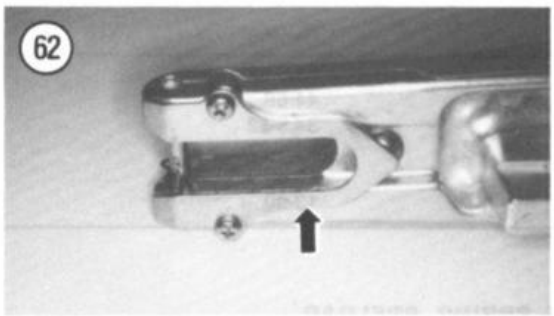


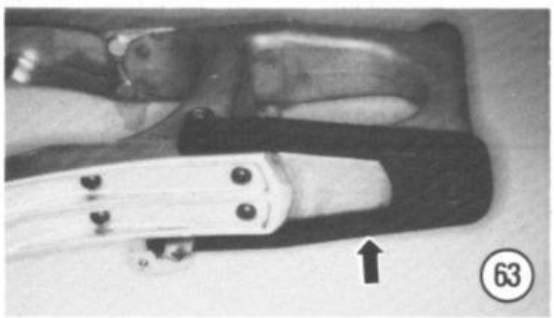












e. Install the new bearings with a hydraulic press. Install the bearing so that it is flush with the end of the swing arm. Repeat for the opposite bearing.

CAUTION

Never reinstall a needle bearing that has been removed. During removal it is damaged and no longer true to alignment. If installed it will damage the sleeve and create an unsafe riding condition.

CAUTION

Do not drive the needle bearings into the swing arm or damage to the bearing will result.

f. Apply a coat of molybdenum disulfide grease to the inner needle bearing surfaces.

8. Check the dust covers (**Figure 55**) for wear or damage. Check the seal inside each cover for wear, tearing or deterioration. Replace the cover(s) if necessary.

9. Make sure the bolts (**Figure 61**) securing the side arms to the front section are tight. Tighten if necessary.

10. Inspect the adjuster plate (**Figure 62**) for wear or damage, replace if necessary.

11. Inspect the chain buffer (**Figure 63**) for wear or damage. To replace; remove the bolts securing the buffer and remove it. Install a new buffer and tighten the bolts securely.

Tables 1-3 are on the following page.

Table 1 REAR SUSPENSION SPECIFICATIONS

Rear wheel	
Travel	280 mm (11.0 in.)
Rim runout limit	
Radial (up and down)	2.0 mm (0.08 in.)
Lateral (side to side)	2.0 mm (0.08 in.)
Rear axle bend limit	0.25 mm (0.01 in.)
Swing arm pivot shaft runout	0.3 mm (0.01 in.)

Table 2 REAR SUSPENSION TIGHTENING TORQUES

	N•m	ft.-lb.
Rear axle nut	85-115	61.5-83
Swing arm pivot bolt and nut	61-94	44-68
Shock absorber bolts and nuts	48-72	34.5-52
Relay arm pivot bolts and nuts	84-120	60.5-87
Lever arm-to-frame bolt and nut	60-96	43.5-69.5
Brake disc mounting bolts	18-28	13-20

Table 3 REAR SHOCK SPRING PRELOAD

Year and model	Standard mm (in.)	Minimum mm (in.)	Maximum mm (in.)
1990-1992 (all models)	269.2 (10.6)	274.2 (10.8)	261.2 (10.3)
1993 DR250 and 1993-on DR350	268.2 (10.5)	273.2 (10.7)	260.2 (10.2)
1993-on DR250S and DR350S	253.4 (10.0)	258.4 (10.2)	235.9 (9.3)

CHAPTER TWELVE

BRAKES

All Suzuki DR models are equipped with a single disc brake on the front and on the rear.

Disc brake specifications are listed in **Table 1**. Tightening torques lare listed in **Table 2**. **Tables 1-2** are at the end of this chapter.

DISC BRAKE

The disc brakes are actuated by hydraulic fluid and controlled by a hand lever (front brake) or brake pedal (rear brake). As the brake pads wear, the brake fluid level drops in the reservoir and automatically adjusts for wear.

When working on a hydraulic brake system, it is necessary that the work area and all tools be absolutely clean. Any tiny particles of foreign matter or grit on the caliper assembly or the master cylinder can damage the components. Also, sharp tools must not be used inside the caliper or on the caliper piston. If there is any doubt about your ability to correctly and safely carry out major service on the brake components, take the job to a Suzuki dealer or brake specialist.

NOTE

If you recycle your old engine oil ***never*** *add used brake fluid to the old engine oil. Most oil retailers that accept old oil for recycling may not accept the oil if other fluids (fork oil, brake fluid or any other type of petroleum based fluids) have been combined with it.*

Consider the following when servicing the front disc brake.

1. Disc brake components rarely require disassembly, so do not disassemble them unless necessary.

WARNING

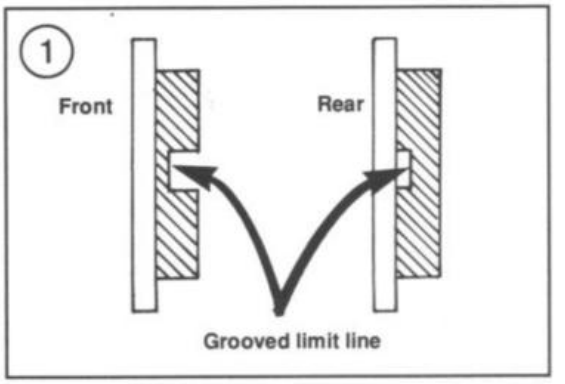
Do not intermix silicone-based (DOT 5) brake fluid as it can cause brake component damage leading to brake system failure.

2. Use only DOT 4 brake fluid from a sealed container.
3. Do not allow disc brake fluid to contact any plastic, painted or plated surfaces or surface damage will occur.

4. Always keep the master cylinder reservoir and spare cans of brake fluid closed to prevent dust or moisture from entering. If moisture enters the brake fluid it would result in brake fluid contamination and brake problems.

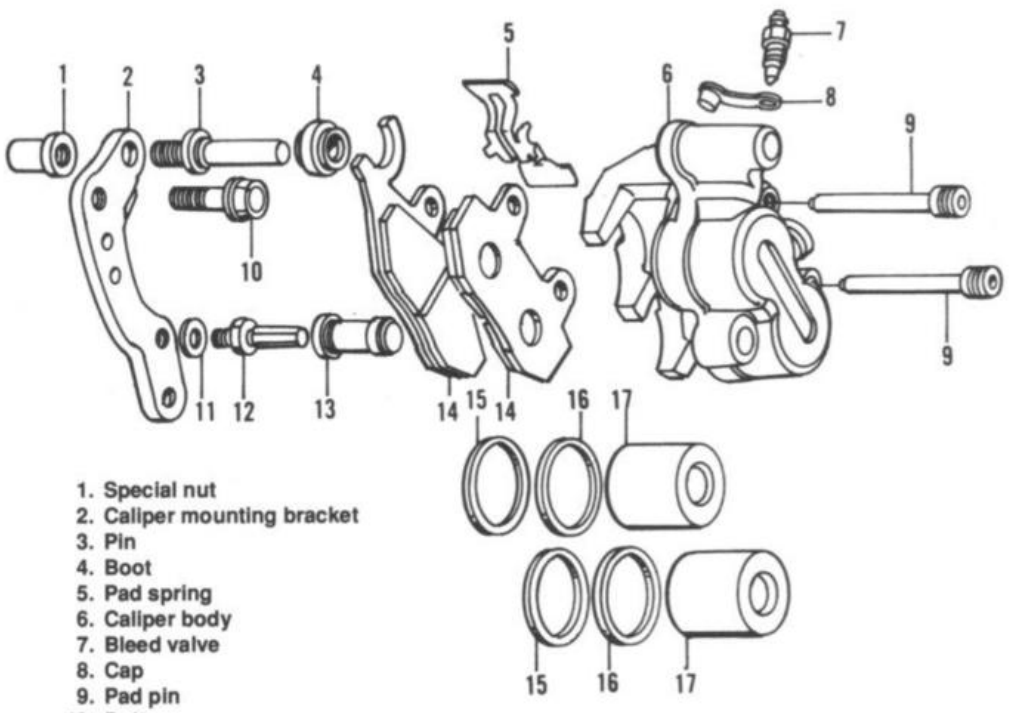
5. Use only disc brake fluid (DOT 4) to wash parts. Never clean any internal brake components with solvent or any other petroleum base cleaners.

6. Whenever *any* component has been removed from the brake system the system is considered "opened" and must be bled to remove air bubbles. Also, if the



2

FRONT BRAKE CALIPER



1. Special nut
2. Caliper mounting bracket
3. Pin
4. Boot
5. Pad spring
6. Caliper body
7. Bleed valve
8. Cap
9. Pad pin
10. Bolt
11. Washer
12. Pin
13. Boot
14. Brake pad set
15. Dust seal
16. Piston seal
17. Piston

brake feels "spongy," this usually means there are air bubbles in the system and it must be bled. For safe brake operation, refer to *Brake Bleeding* in this chapter.

CAUTION

Do not use solvents of any kind on the brake systems' internal components. Solvents will cause the seals to swell and distort. When disassembling and cleaning brake components (except brake pads) use new DOT 4 brake fluid.

WARNING

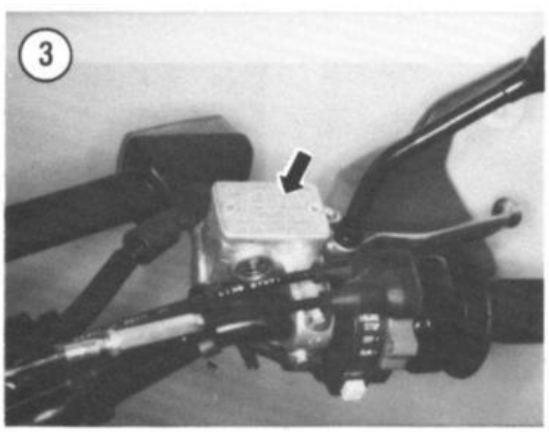
When working on the brake system, do ***not*** *inhale brake dust. It may contain asbestos, which can cause lung injury and cancer. Wear a disposable face mask and wash your hands and forearms thoroughly after completing the work.*

FRONT BRAKE PAD REPLACEMENT

There is no recommended mileage interval for changing the friction pads in the disc brake. Pad wear depends greatly on riding habits and conditions. The pads should be checked for wear every 5,000 km (3,000 miles) or every 15 months and replaced when the lining thickness reaches the minimum thickness listed in **Table 1**.

CAUTION

*Watch the pads more closely when the wear line groove (**Figure 1**) approaches the disc. On some pads the wear line is very close to the metal backing plate. If pad wear happens to be uneven for some reason the backing plate may come in contact with the disc and cause damage.*



To maintain an even brake pressure on the disc, always replace both pads in the caliper at the same time. Always use brake pads from the same manufacturer—never intermix different brands.

It is not necessary to remove or disassemble the brake caliper assembly to replace the brake pads.

Refer to **Figure 2** for this procedure.

1. Place the bike on a stand so the front wheel clears the ground.
2. The pistons must be repositioned within the caliper assembly prior to installing the new *thicker* brake pads. The front master cylinder brake fluid level will rise as the caliper piston is being repositioned in the following steps. Perform the following:
   a. Clean the top of the front master cylinder of all dirt and foreign matter.
   b. Remove the screws securing the top cover (**Figure 3**) and remove the top cover and diaphragm from the master cylinder.
   c. Note the brake fluid level in the reservoir. If it is up to, or close to, the top surface of the reservoir, siphon off some of the fluid at this time.
   d. Push the caliper assembly toward the brake disc until it stops. This will reposition the pistons into the caliper cylinders.
   e. Constantly check the reservoir to make sure the brake fluid does not overflow. Remove brake fluid, if necessary, prior to it overflowing.
   f. The pistons should move freely during repositioning. If they don't, and there is evidence of them sticking in the cylinder, the caliper should be removed and serviced as described in this chapter.
3. To prevent accidental application of the front brake lever, place a spacer between the front brake lever and the hand grip. Hold the spacer in place with a large rubber band, a tie wrap or a piece of tape.
4. Loosen both pad pin bolts (**Figure 4**).
5. Remove the caliper mounting bolts (**Figure 5**).
6. Carefully pull the caliper and mounting bracket off the disc.
7. Remove the pad pin bolts (**Figure 6**).

8. Remove both brake pads from the caliper.

9. Check the brake pad friction surface (**Figure 7**) for oil and dirt contamination. Also check the friction material for cracking or other damage. Replace the brake pads if the surface is contaminated or damaged.

10. Measure the brake pad friction thickness with a vernier caliper (**Figure 8**) or ruler. Compare to the specifications in **Table 1**. Replace the brake pads if the friction thickness is worn to the service limit or less.

11. Carefully remove any rust or corrosion from the brake disc.

12. Make sure the friction material faces against the brake disc.

13. Make sure the pad spring (**Figure 9**) is still in place in the caliper.

14. Install the outboard brake pad (**Figure 10**).

15. Correctly position the outboard pad and index the hook on the brake pad with the post on the caliper mounting bracket (**Figure 11**). Pivot the brake pad down into place (**Figure 12**).

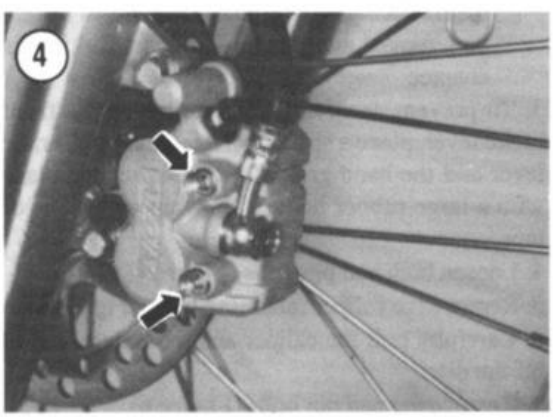
16. Lightly coat the pad pin bolts with a Lithium base grease.

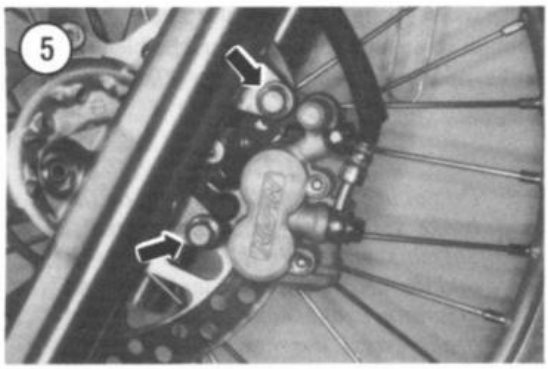
17. Push both brake pads down against the pad spring and align the bolt holes in both brake pads with the bolt holes in the caliper bracket.

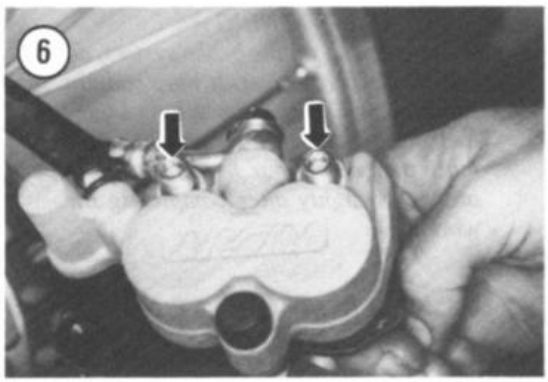
18. Install both pad pin bolts (**Figure 6**) and screw them all the way in but do not tighten at this time.

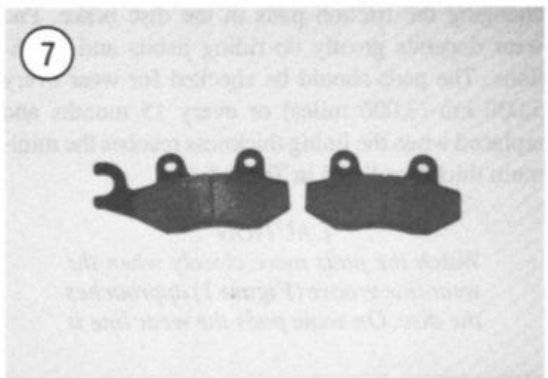
19. Carefully install the caliper assembly onto the brake disc. Do not damage the leading edge of the pads during installation.

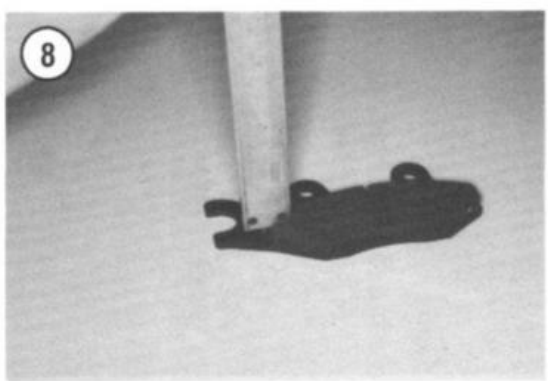
20. Align the bolt holes and install the caliper mounting bolts (**Figure 5**). Tighten the bolts to the torque specification in **Table 2**.

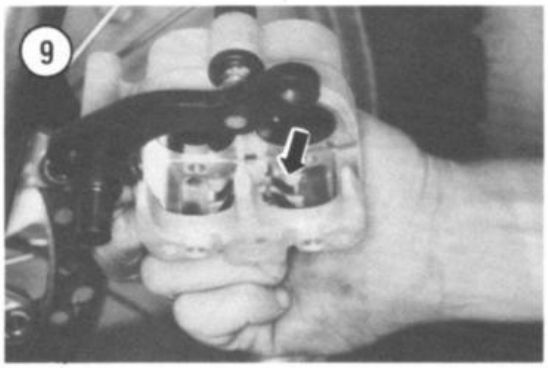


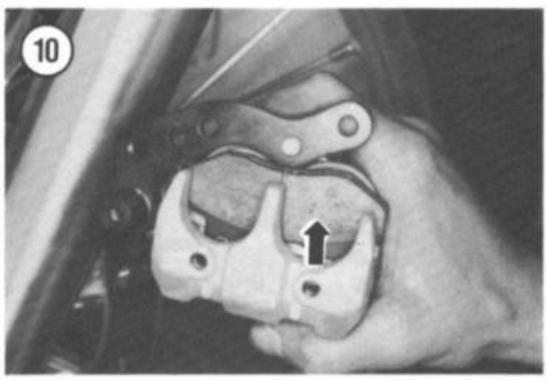


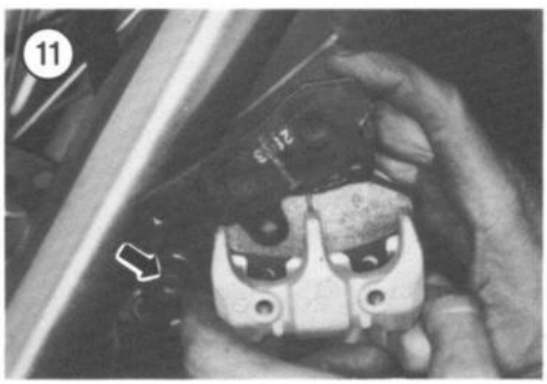


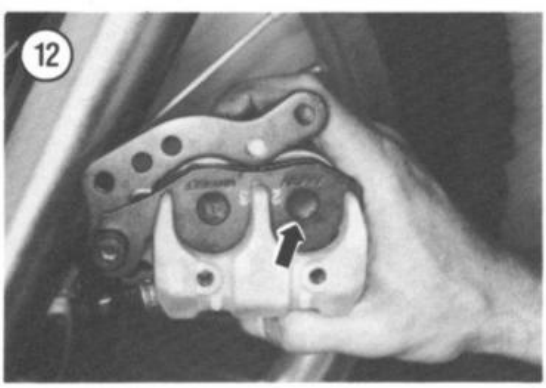












21. Tighten the pad pin bolts (**Figure 4**) to the torque specification in **Table 2**.

22. Spin the front wheel and activate the brake lever as many times as required to refill the piston cylinders in the caliper and correctly locate the pads.

WARNING

Use brake fluid clearly marked DOT 4 from a sealed container. Other types may vaporize and cause brake failure. Always use the same brand name; do not intermix as many brands are not compatible. Do not intermix silicone based (DOT 5) brake fluid as it can cause brake component damage leading to brake system failure.

23. Refill the master cylinder reservoir, if necessary, to maintain the correct brake fluid level. Install the diaphragm and top cover (**Figure 3**) and tighten the screws securely.

WARNING

Do not ride the motorcycle until you are sure the brake is operating correctly with full hydraulic advantage. If necessary, bleed the brake system as described in this chapter.

24. Bed the pads in gradually for the first 80 km (50 miles) by using only light pressure as much as possible. Immediate hard application will glaze the new friction pads and greatly reduce the effectiveness of the brake.

12

FRONT BRAKE CALIPER

Removal/Installation

Refer to **Figure 2** for this procedure.

1. Place the bike on a stand so the front wheel clears the ground.
2. Drain the master cylinder and caliper as follows:
   a. Remove the cap (**Figure 13**) from the bleed valve.
   b. Attach a hose to the bleed valve on the caliper assembly.
   c. Place the loose end of the hose in a container to catch the brake fluid.
   d. Open the bleed valve and continue to apply the front brake lever until the brake fluid is

pumped out of the system. Dispose of this brake fluid—never reuse brake fluid.

e. Disconnect the hose and tighten the bleed valve.

3. Loosen the brake caliper union bolt (A, **Figure 14**). Remove the union bolt and sealing washers.

4. Remove the mounting bolts (B, **Figure 14**) securing the caliper assembly to the fork slider.

5. To prevent the entry of moisture and dirt, cap the end of the brake line and tie the loose end up to the forks.

6. Slide the caliper assembly (C, **Figure 14**) off of the brake disc and remove the caliper assembly.

7. Install by reversing these removal steps while noting the following:

a. Install the caliper assembly onto the brake disc and front fork.

b. Install the mounting bolts (B, **Figure 14**) and tighten to the torque specification in **Table 2**.

c. Install the brake hose, with a *new* sealing washer (**Figure 15**) on each side of the fitting, onto the caliper. Install the union bolt (A, **Figure 14**) and tighten to the torque specification in **Table 2**.

d. If removed, install the brake pads as described in this chapter.

e. Bleed the brake as described in this chapter.

WARNING

Do not ride the motorcycle until you are sure the brake is operating properly.

Disassembly/Inspection/Assembly

Refer to **Figure 2** for this procedure.

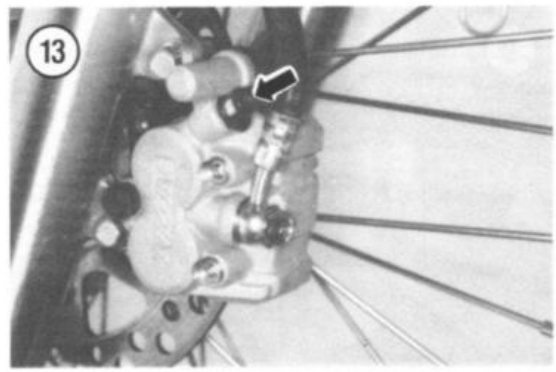
WARNING

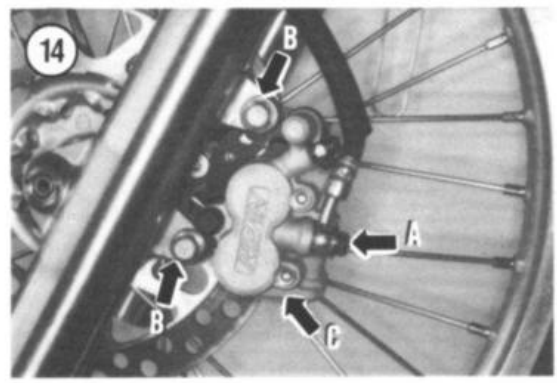
When working on the brake system, do ***not*** *inhale brake dust. It may contain asbestos, which can cause lung injury and cancer. Wear a disposable face mask and wash your hands and forearms thoroughly after completing the work.*

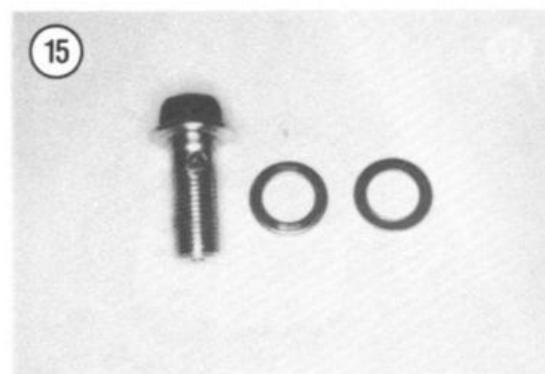
1. Remove the caliper assembly as described in this chapter.

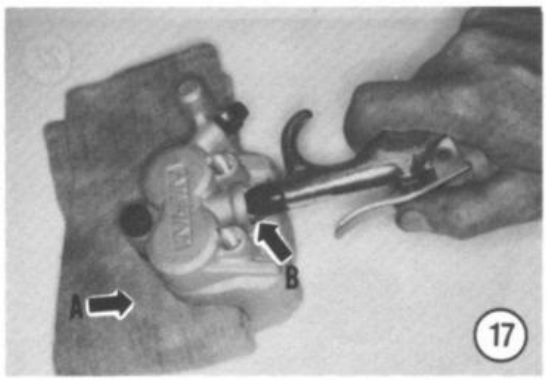
2. If the brake pads are still installed, remove them as described in this chapter.

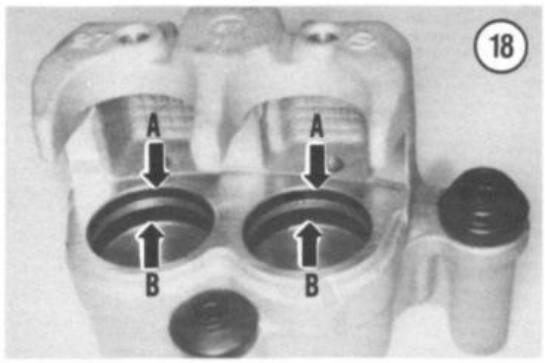
3. Carefully pull the caliper carrier straight up and off of the caliper body.

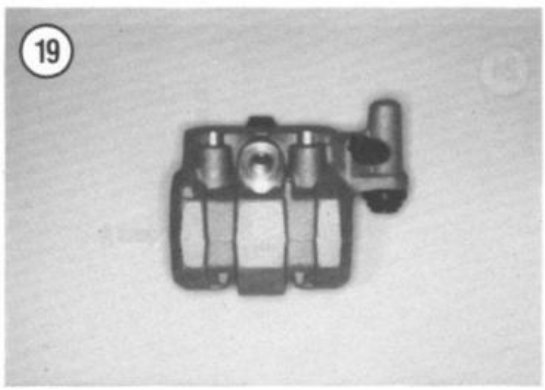


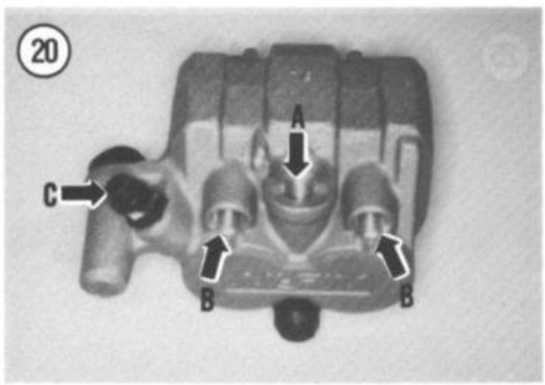












4. Remove the pad spring (**Figure 16**) from the caliper body.
5. Withdraw the pistons from the caliper body. If you cannot remove either piston easily, perform the following:
   a. Either wrap the caliper body and pistons with a heavy cloth or place a shop cloth (A, **Figure 17**) or piece of soft wood over the end of the pistons.
   b. Perform this step over and close down to a workbench top. Hold the caliper body with the pistons facing away from you.

WARNING

In the next step, the pistons may shoot out of the caliper body like bullets. Keep your fingers out of the way. Wear shop gloves and apply air pressure gradually. Do ***not*** *use high pressure air nor place the air hose nozzle directly against the hydraulic fluid passageway in the caliper body. Hold the air nozzle away from the inlet allowing some of the air to escape during the procedure.*

   c. Apply the air pressure in short spurts to the hydraulic fluid passageway (B, **Figure 17**) and force the piston out of the caliper body. Use a service station air hose if you don't have an air compressor.
6. Use a piece of plastic or wood and carefully push the dust seal (A, **Figure 18**) and piston seal (B, **Figure 18**) in toward the caliper cylinder and out of their grooves.
7. Remove both dust and piston seals from the cylinders in the caliper body. Discard both seals as they cannot be reused after removal as they will no longer seal effectively.
8. Inspect the caliper body (**Figure 19**) for damage, replace the caliper body if necessary.
9. Inspect the union bolt hole threads (A, **Figure 20**) and the pad pin bolt threads (B, **Figure 20**). If the threads are slightly damaged; clean them up with a proper size thread tap. If the threads are worn or damaged beyond a "thread clean up," replace the caliper assembly.
10. Remove the bleed screw (C, **Figure 20**) from the caliper body.
11. Make sure the hole in the bleed screw is clean and open. Apply compressed air to the opening and make sure it is clear. Clean out if necessary with fresh brake fluid.

12. Inspect the hydraulic fluid passageway (**Figure 21**) in the base of each cylinder bore. Make sure it is clean and open. Apply compressed air to the opening and make sure it is clear. Clean out if necessary with fresh brake fluid.

13. Inspect the piston seal and dust seal grooves (**Figure 22**) for scoring or other damage. If the grooves are rusty or corroded, replace the caliper assembly.

14. Measure the cylinder inside diameter and compare to the dimension listed in **Table 1**. Replace the caliper assembly if worn to the service limit dimension or greater.

15. Inspect the cylinder wall (A, **Figure 23**) for scratches, scoring or other damage. If it is rusty or corroded, replace the caliper assembly.

16. Inspect the piston wall (A, **Figure 24**) and end (B, **Figure 24**) for scratches, scoring or other damage. If it is rusty or corroded, replace the piston.

17. Measure the piston outside diameter (**Figure 25**) and compare to the dimension listed in **Table 1**. Replace the caliper assembly if either is worn to the service limit dimension or greater. The piston(s) cannot be replaced separately.

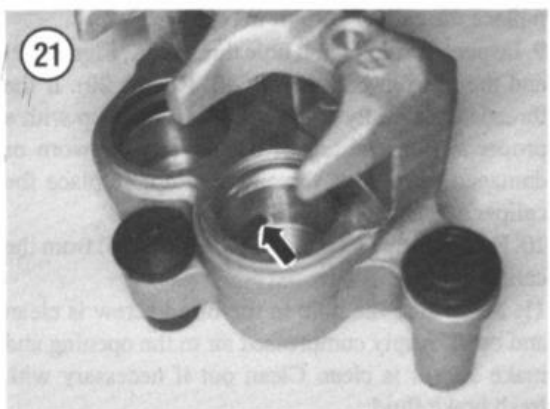
18. Inspect the caliper mounting bracket (**Figure 26**) for damage; replace if necessary.

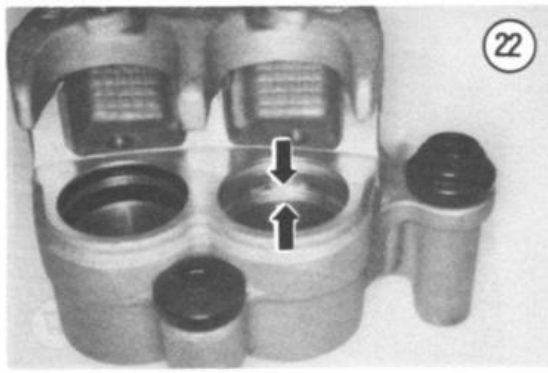
19. Inspect the bracket pin rubber boots (B, **Figure 23**) for wear or deterioration. Replace if necessary.

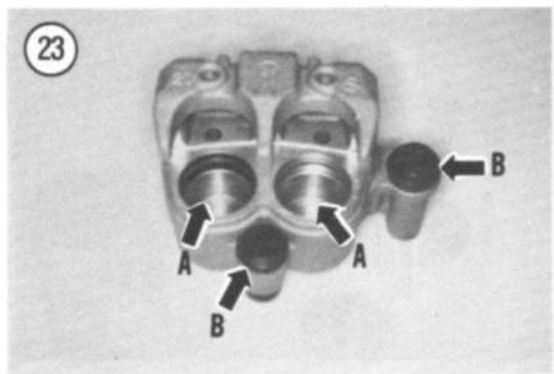
20. Inspect both pad pin bolts (**Figure 27**) for scoring, wear or damage. If damaged, replace the bracket.

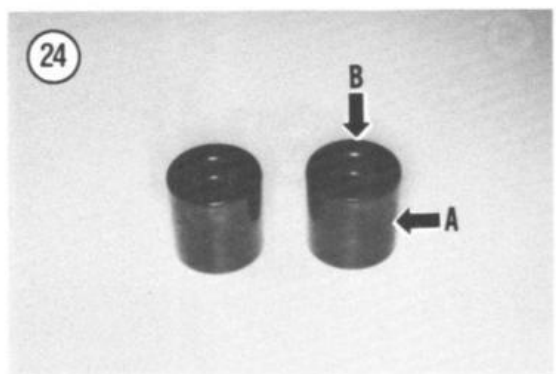
21. Inspect the brake pad spring (**Figure 28**) for wear, damage or sagging, replace if necessary.

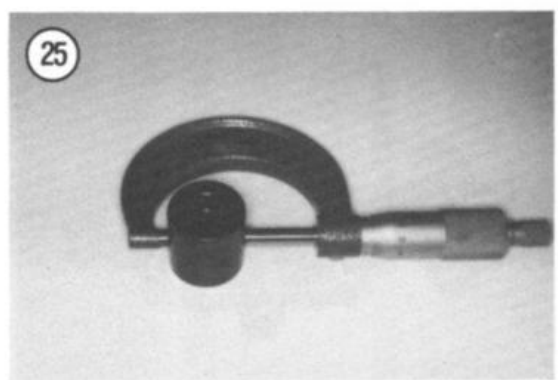
22. If serviceable, clean the caliper body with rubbing alcohol and rinse with clean DOT 4 brake fluid.

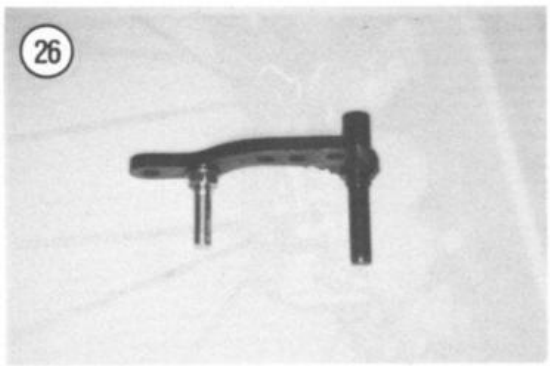


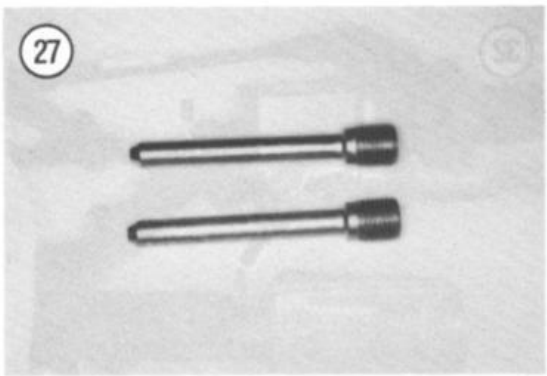


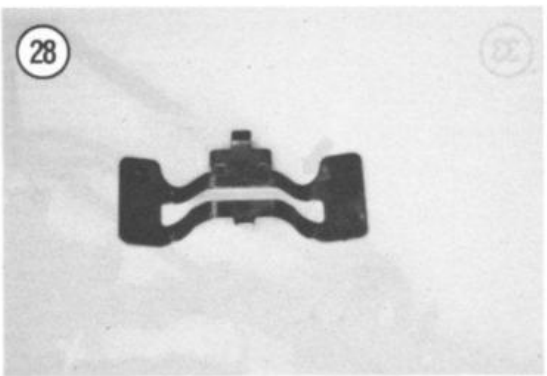


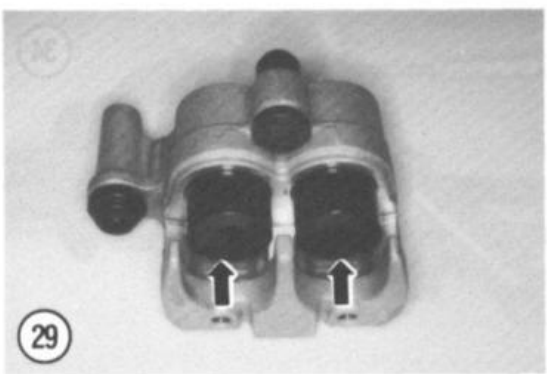












NOTE

Never reuse a piston seal or dust seal that has been removed. Very minor damage or age deterioration can make the seal useless.

23. Coat the new dust seal and piston seal with fresh DOT 4 brake fluid.

WARNING

Check that the seal fits squarely in the cylinder bore groove. If the seal is not installed properly, the caliper assembly will leak and braking performance will be reduced.

24. Carefully install the new piston seal (B, **Figure 18**) in the groove in the caliper cylinder. Make sure the seal is properly seated in the groove.
25. Install the new dust seal (A, **Figure 18**) onto the groove in the caliper cylinder. Make sure the seal is properly seated in the groove.
26. Coat the piston and the caliper cylinder with fresh DOT 4 brake fluid.
27. Position the pistons with the sealed end facing out and install the pistons into the caliper cylinders (**Figure 29**).
28. Use a suitable size socket and carefully press the piston in until it bottoms out. Repeat for the other piston.
29. Install the bleed screw and tighten to the specification listed in **Table 2**.
30. If removed, install the rubber boots (B, **Figure 23**) onto the caliper bracket pins.
31. Apply a light coat of a Lithium base grease to both bracket pins and to the rubber boots.
32. Carefully push the caliper bracket straight onto the caliper body.
33. Install the brake pad spring (**Figure 16**).
34. Install the brake caliper assembly as described in this chapter.

FRONT MASTER CYLINDER

Removal/Installation

1. Place the bike on a stand so the front wheel clears the ground.
2. Remove the right-hand rear view mirror.
3. Remove the upper screw and washer (A, **Figure 30**) and the lower nut and washer securing the knuckle guard to the brake lever mounting bolt.

Remove the knuckle guard (B, **Figure 30**) and the top plate.

4. Drain the master cylinder as follows:
   a. Remove the cap (**Figure 31**) from the bleed valve on the front caliper.
   b. Attach a hose to the bleed valve on the caliper assembly.
   c. Place the loose end of the hose in a container to catch the brake fluid.
   d. Open the bleed valve and continue to apply the front brake lever until the brake fluid is pumped out of the master cylinder and the upper portion of the brake hose. Dispose of this brake fluid—never reuse brake fluid. It is not necessary to pump all of the brake fluid out of the front brake system.
   e. Disconnect the hose and tighten the bleed valve.

5. On DR250S and DR350S models, disconnect the electrical connector from the brake switch (A, **Figure 32**).

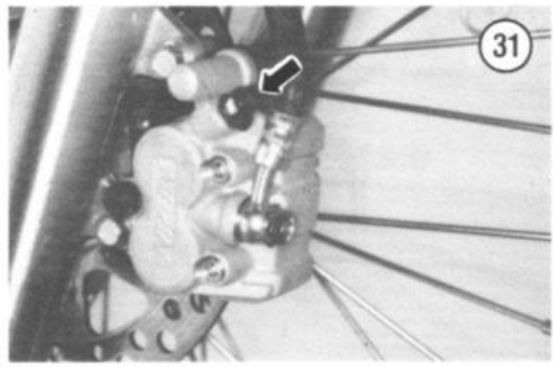
6. Slide the rubber boot (B, **Figure 32**) off the union bolt.

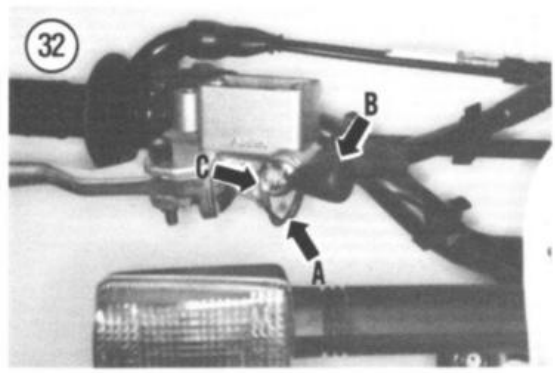
7. Loosen the brake hose union bolt (C, **Figure 32**) at the master cylinder. Remove the bolt and both sealing washers.

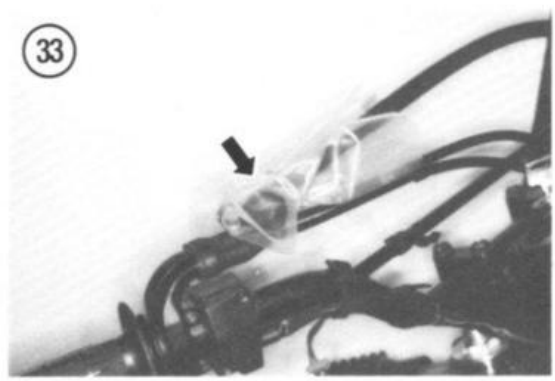
8. Place the loose end of the brake hose in a reclosable plastic bag (**Figure 33**) to prevent brake fluid from dripping onto other parts. Close the bag onto the hose to keep it in place.

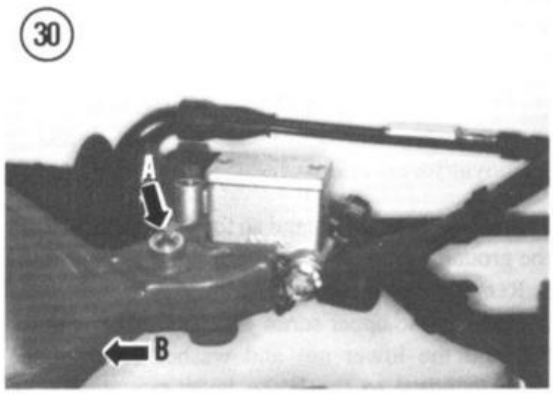
9. Remove the bolts (**Figure 34**) holding the master cylinder to the handlebar. Remove the master cylinder.

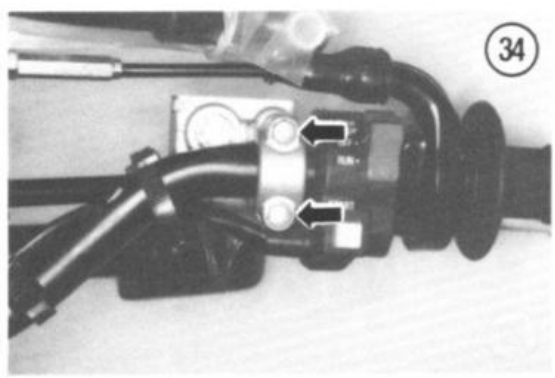
10. Install by reversing these removal steps while noting the following:

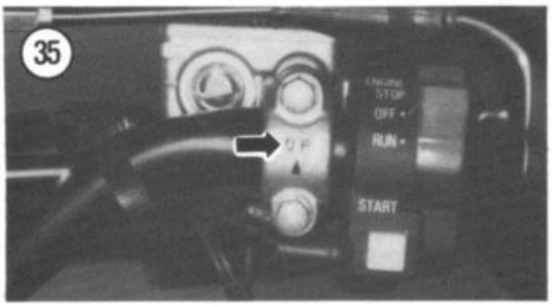


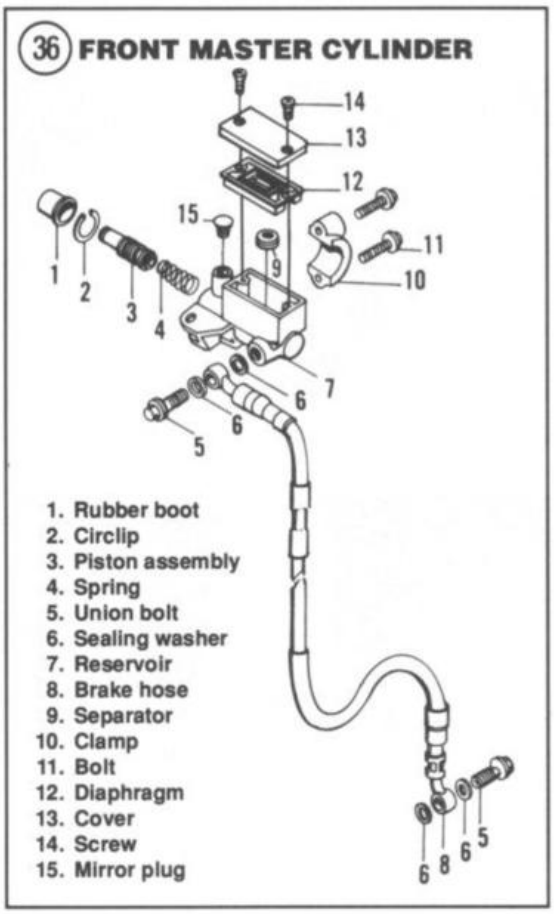


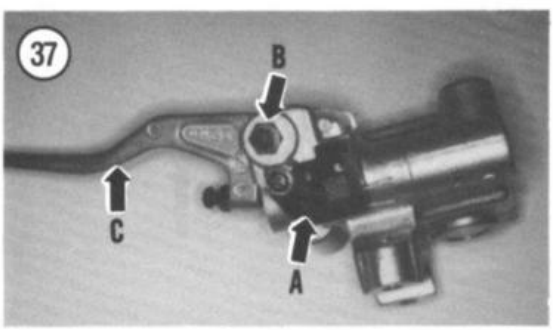












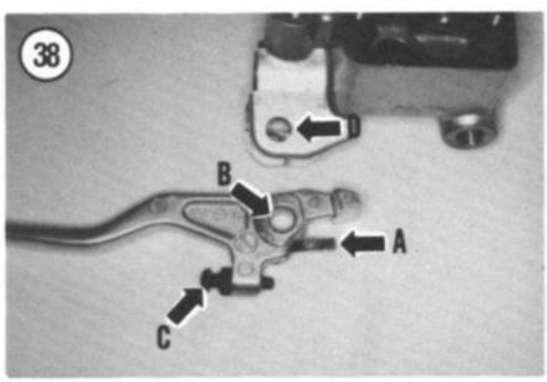
a. Mount the master cylinder housing onto the handlebar assembly. Install the handlebar clamp so that the arrow faces UP (**Figure 35**).
b. Remove the end of the brake hose from the plastic bag and discard the bag properly.
c. Insert the union bolt and *new* sealing washers onto the brake hose. Install the union bolt (C, **Figure 32**) and tighten to the torque specification in **Table 2**.
d. On DR250S and DR350S models, connect the electrical connector onto the brake switch.
e. Refill the master cylinder and bleed the brake as described in this chapter.

WARNING
Do not ride the bike until the front brake is working properly.

Disassembly

Refer to **Figure 36** for this procedure.

1. Remove the master cylinder as described in this chapter.
2. Remove the screws securing the reservoir cover.
3. Remove the cover and the diaphragm. Pour out the remaining brake fluid and discard it. *Never* reuse brake fluid.
4. Remove the screw securing the brake light switch (A, **Figure 37**) and remove the switch.
5. Remove the brake lever nut (B, **Figure 37**) and pivot bolt and remove the brake lever (C, **Figure 37**).
6. Remove the spring (A, **Figure 38**) from the brake lever.
7. Remove the rubber boot (**Figure 39**) from the area where the hand lever actuates the internal piston.
8. Using circlip pliers, remove the piston circlip (**Figure 40**).



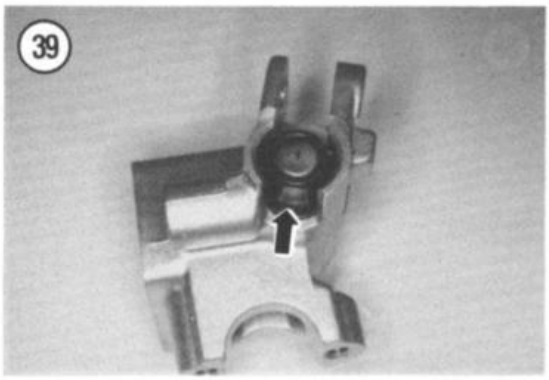
CAUTION

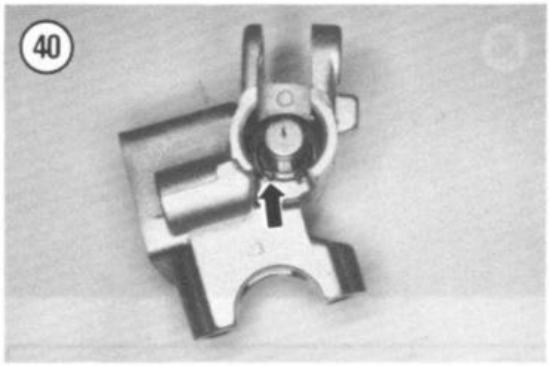
Do not remove the primary or secondary cup from the piston when removing the piston assembly in Step 9. Removing the cups from the piston will damage them.

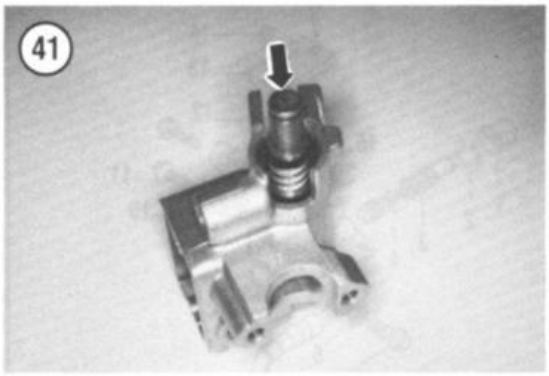
9. Carefully withdraw the piston assembly (**Figure 41**) from the reservoir.

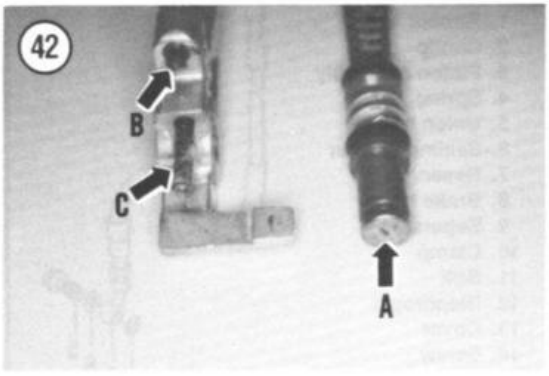
Inspection

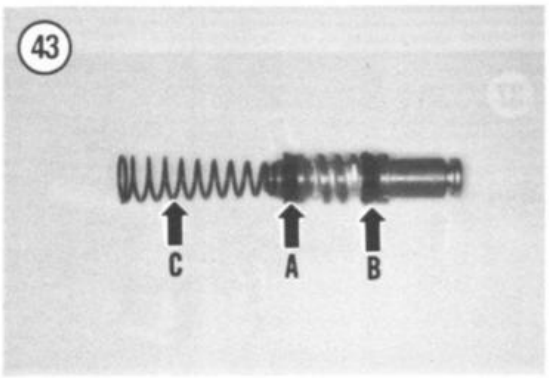
1. Clean all parts in fresh DOT 4 brake fluid. Place the master cylinder components on a clean lint-free cloth when performing the following inspection procedures.
2. Check the end of the piston (A, **Figure 42**) for wear caused by the hand lever (B, **Figure 42**). Replace the entire piston assembly if any portion of it requires replacement.
3. Inspect the primary (A, **Figure 43**) and secondary (B, **Figure 43**) cups on the piston assembly for damage, softness or swollen conditions. Replace the piston assembly if any cup is damaged, the individual cups cannot be replaced separately.
4. Check the spring (C, **Figure 43**) for cracks, distortion or other damage; replace if necessary.
5. Measure the outside diameter of the piston with a vernier caliper or micrometer (**Figure 44**). Replace the master cylinder if the piston is less than the specifications given in **Table 1**.
6. Inspect the master cylinder bore for wear or damage. Replace if necessary.
7. Measure the cylinder bore with a small snap hole gauge (**Figure 45**). Then measure the gauge with a micrometer (**Figure 46**) to determine the master cylinder bore diameter. Replace the master cylinder if the bore exceeds the specifications given in **Table 1**.

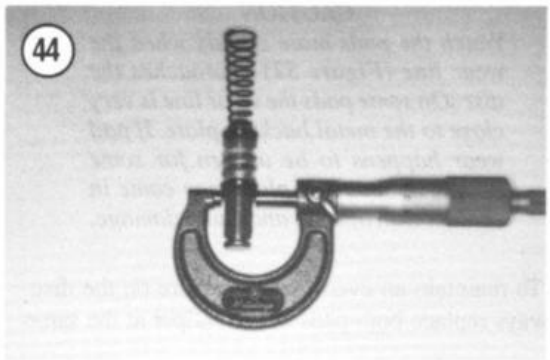


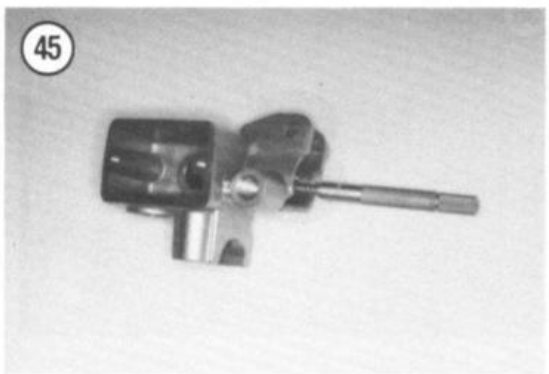


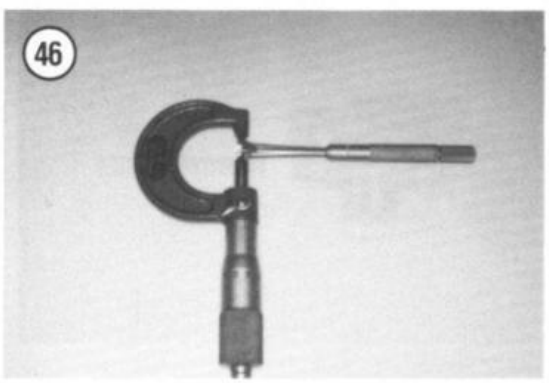


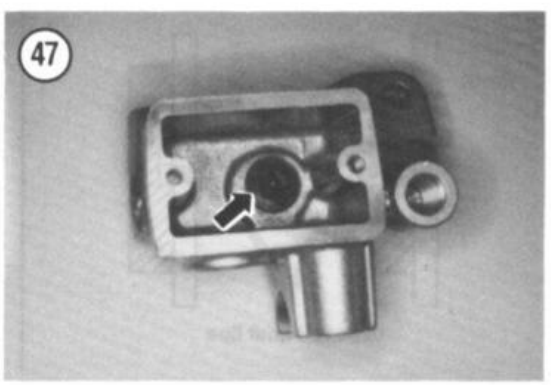








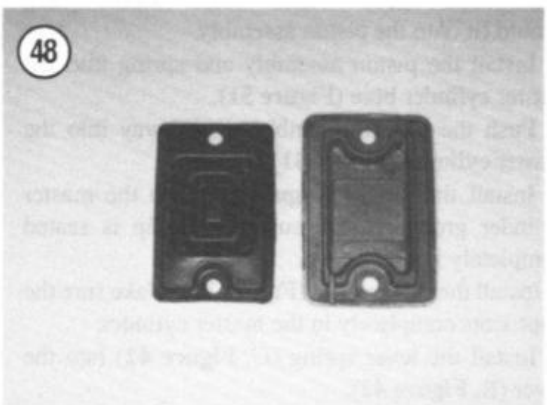


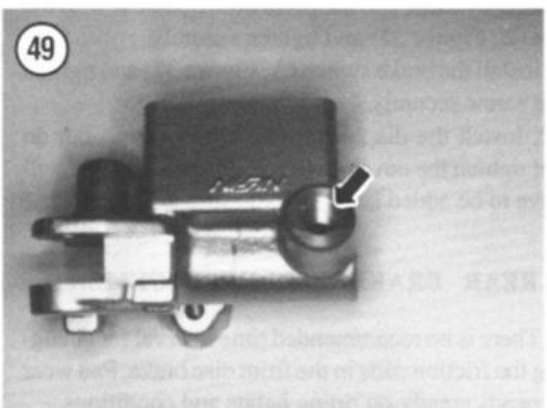


8. Remove the separator (**Figure 47**) from the base of the reservoir.
9. Make sure the passage way, under the separator, in the bottom of the brake fluid reservoir is clear. If necessary, clean out with a small wire and blow out with compressed air.
10. Check the reservoir cap and diaphragm (**Figure 48**) for damage and deterioration. Replace if necessary.
11. Inspect the brake hose union bolt threads (**Figure 49**) in the master cylinder body. Repair the threads if stripped or damaged.
12. Check the circlip groove in the master cylinder bore for cracks, breakage or other damage. Replace the master cylinder if the groove is damaged in anyway.

NOTE

The brake lever pivot bolt is unique since the knuckle protector is attached to the top and bottom of the bolt. Do not install a regular bolt since the knuckle protector cannot be attached to it.





13. Inspect the pivot hole (B, **Figure 38**) and the adjust bolt and nut (C, **Figure 38**) in the hand lever. If worn, replace the hand lever.
14. Check the brake lever pivot bolt lug (D, **Figure 38**) in the master cylinder for excessive wear or elongation; replace the master cylinder if necessary.
15. Inspect the rubber boot (**Figure 50**) for wear, tears or deterioration. Replace if necessary.

Assembly

1. Soak the piston cups and piston assembly in fresh DOT 4 brake fluid for approximately 15 minutes to make them pliable. Coat the inside of the cylinder with fresh DOT 4 brake fluid prior to assembling the parts.

CAUTION

When installing the piston assembly, do not allow the cups to turn inside out as they will be damaged and allow brake fluid to leak within the cylinder bore.

2. Install the spring onto the end of the piston as shown in C, **Figure 43**. The small end of the spring should fit onto the piston assembly.
3. Install the piston assembly and spring into the master cylinder bore (**Figure 51**).
4. Push the piston assembly all the way into the master cylinder (**Figure 41**).
5. Install the circlip (**Figure 40**) into the master cylinder groove. Make sure the circlip is seated completely in the groove.
6. Install the rubber boot (**Figure 39**). Make sure the boot seats completely in the master cylinder.
7. Install the lever spring (C, **Figure 42**) into the lever (B, **Figure 42**).
8. Install the brake lever (C, **Figure 37**) onto the master cylinder and the pivot bolt. Secure it with the nut (B, **Figure 37**) and tighten securely.
9. Install the brake switch (A, **Figure 37**) and tighten the screw securely.
10. Install the diaphragm and cover. Install but do not tighten the cover screws at this time as fluid will have to be added later.

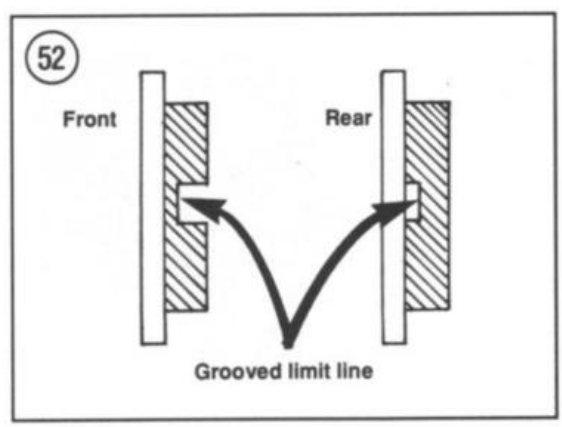
REAR BRAKE PAD REPLACEMENT

There is no recommended time interval for changing the friction pads in the front disc brake. Pad wear depends greatly on riding habits and conditions.

CAUTION

*Watch the pads more closely when the wear line (**Figure 52**) approaches the disc. On some pads the wear line is very close to the metal backing plate. If pad wear happens to be uneven for some reason the backing plate may come in contact with the disc and cause damage.*

To maintain an even brake pressure on the disc, always replace both pads in the caliper at the same



time. Always use brake pads from the same manufacturer in the front caliper—never intermix different brands.

It is not necessary to remove or disassemble the brake caliper assembly to replace the brake pads.

Refer to **Figure 53** for this procedure.

1. Place the bike on a stand so the rear wheel clears the ground.

2. The piston must be repositioned within the caliper assembly prior to installing the new *thicker* brake pads. The rear master cylinder brake fluid level will rise as the caliper piston is being repositioned in the following step. Perform the following:

a. Remove the bolt (A, **Figure 54**) securing the reservoir and guard.

b. Clean the top of the rear master cylinder of all dirt and foreign matter.

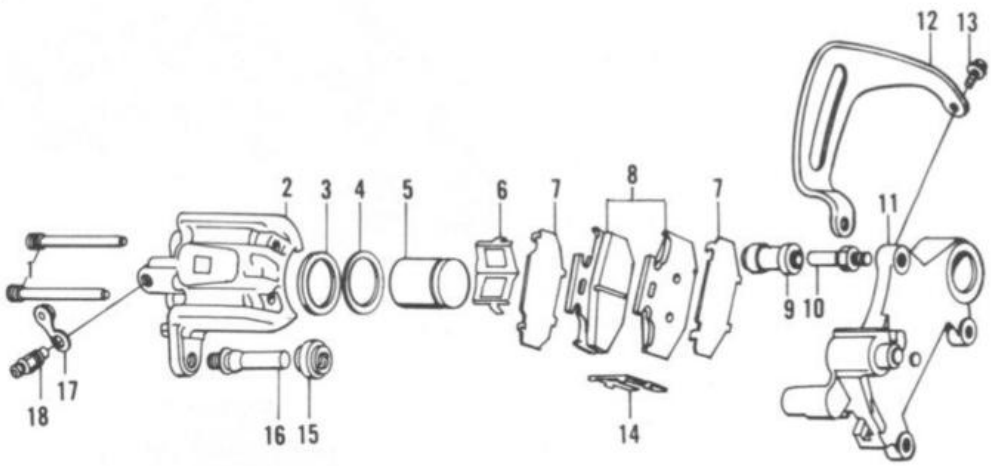
c. Hold the reservoir upright and unscrew the top cover (B, **Figure 54**). Remove the plate and diaphragm from the reservoir.

d. Reposition the reservoir (A, **Figure 55**) on the frame, reinstall the bolt and tighten to a good finger-tight. Place a shop cloth (B, **Figure 55**) under the reservoir to catch any spilled fluid.

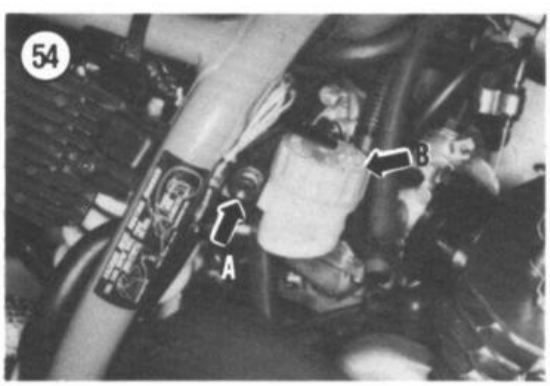
e. Note the brake fluid level in the reservoir. If it is up to, or close to, the top surface of the

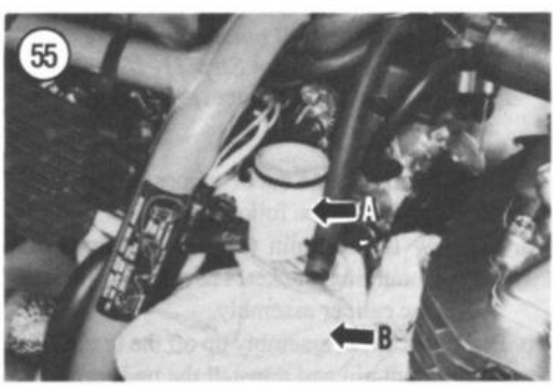
53

REAR BRAKE CALIPER



1. Pad pin
2. Caliper body
3. Piston seal
4. Dust seal
5. Piston
6. Pad spring
7. Pad shim
8. Brake pad set
9. Boot
10. Rear pin
11. Caliper mounting bracket
12. Caliper guard
13. Bolt
14. Pad retainer
15. Boot
16. Pin
17. Cap
18. Bleed valve





reservoir, siphon off some of the fluid at this time.

f. Push the caliper assembly toward the brake disc until it stops. This will reposition the piston into the caliper cylinder.

g. Constantly check the reservoir to make sure the brake fluid does not overflow. Remove brake fluid, if necessary, prior to it overflowing.

h. The piston should move freely during repositioning. If it doesn't, and there is evidence of them sticking in the cylinder, the caliper should be removed and serviced as described in this chapter.

3. To prevent accidental application of the rear brake pedal, tie the pedal up to the exterior of the engine or frame.

4. Remove the bolts securing the caliper guard (**Figure 56**) and remove the guard.

5. Loosen, then remove the pad pin bolts (**Figure 57**).

6. Carefully slide the brake pads out toward the rear and out of the caliper. The pad spring should stay in place within the caliper recess.

7. Check the brake pad friction surface (**Figure 58**) for oil and dirt contamination. Also check the friction material for cracking or other damage. Replace the brake pads if the surface is contaminated or damaged.

8. Measure the brake pad friction thickness with a vernier caliper (**Figure 59**) or ruler. Compare to the specifications in **Table 1**. Replace the brake pads if the friction thickness is too thin.

9. Check the end of the piston assembly in the caliper for signs of fluid leakage or other abnormal conditions.

10. Carefully remove any rust or corrosion from the brake disc.

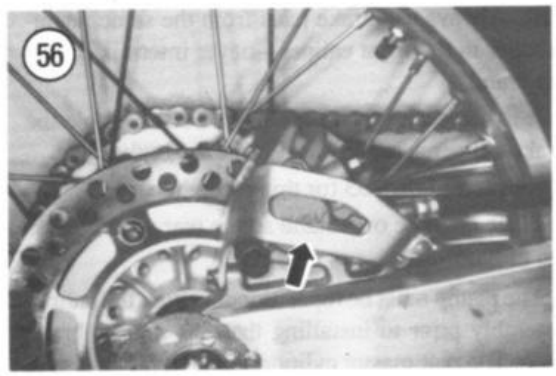
NOTE

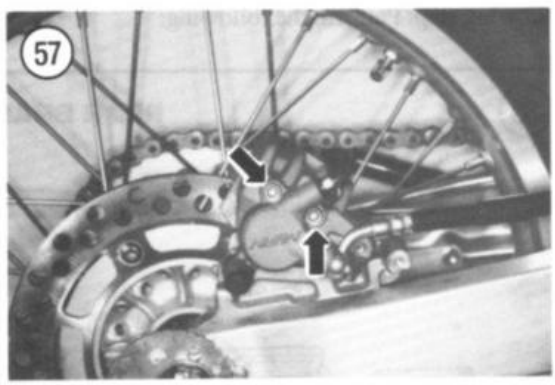
If the pad spring fell out during brake pad removal, perform Step 11. If the pad spring is still in place, proceed to Step 12.

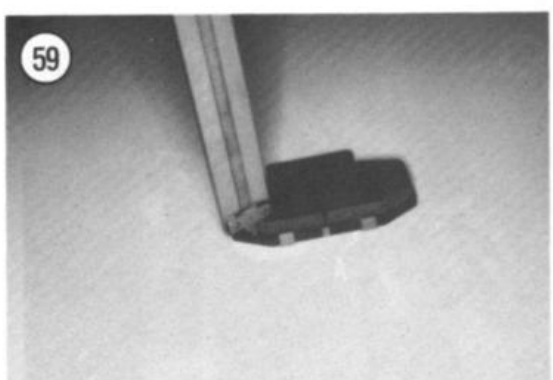
11. If the pad spring came out of caliper during brake pad removal, perform the following:

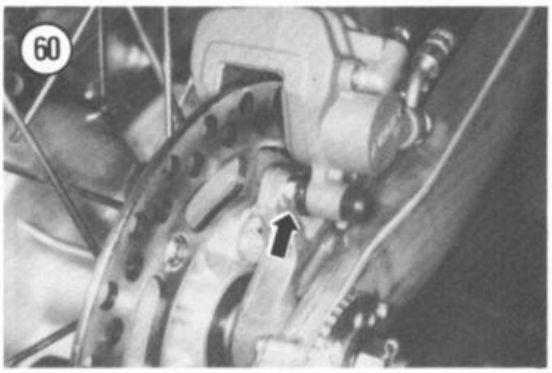
a. Unscrew the rear pin (**Figure 60**) from the caliper mounting bracket. The rear pin will stay within the caliper assembly.

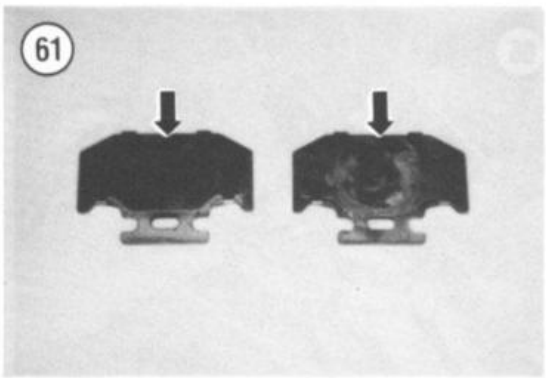
b. Pivot the caliper assembly up off the brake disc on the front pin and reinstall the pad spring.

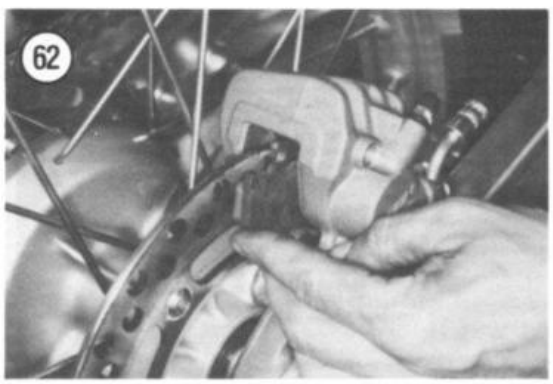


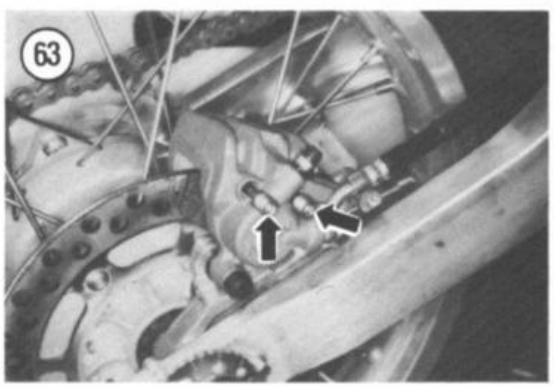












c. Pivot the caliper assembly back down and install the front pin. Tighten the pin securely.

12. Make sure the shim is in place on the back of each brake pad (**Figure 61**).

13. Install the outboard brake pad (**Figure 62**).

14. Align the notches (for the bolts) in the brake pad and the caliper assembly and partially install the pad pin bolts (**Figure 63**) through the outboard brake pad.

15. Install the inboard pad (A, **Figure 64**) and push the pad pin bolts through the notches in the brake pad.

16. Screw the pad pin bolts (B, **Figure 64**) all the way in and tighten to the torque specification in **Table 2**.

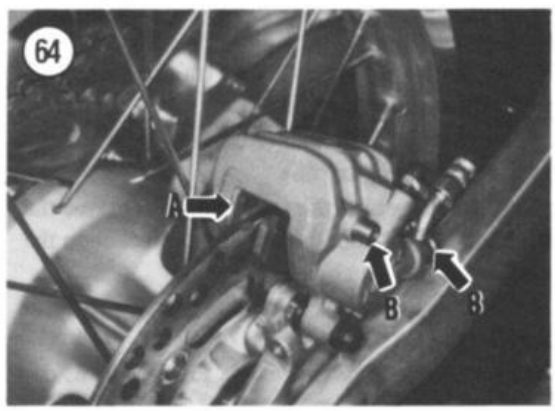
17. Install the caliper guard (**Figure 56**) and tighten the bolts securely.

18. Spin the rear wheel and activate the brake pedal as required to refill the cylinder in the caliper and correctly locate the pads.

WARNING

Use brake fluid clearly marked DOT 4 from a sealed container. Other types may vaporize and cause brake failure. Always use the same brand name; do not intermix as many brands are not compatible. Do not intermix silicone-based (DOT 5) brake fluid as it can cause brake component damage leading to brake system failure.

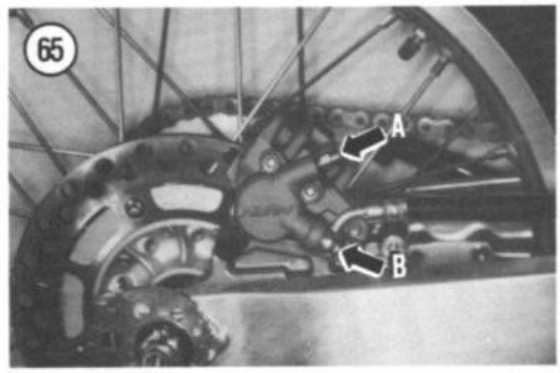
19. Refill the master cylinder reservoir, if necessary, to maintain the correct brake fluid level. Install the diaphragm, plate and top cover (B, **Figure 54**). Install the guard and reservoir mounting bolt (A, **Figure 54**) and tighten the bolt securely.



WARNING

Do not ride the motorcycle until you are sure the brake is operating correctly with full hydraulic advantage. If necessary, bleed the brake system as described in this chapter.

20. Bed the pads in gradually for the first 80 km (50 miles) by using only light pressure as much as possible. Immediate hard application will glaze the new friction pads and greatly reduce the effectiveness of the brake.

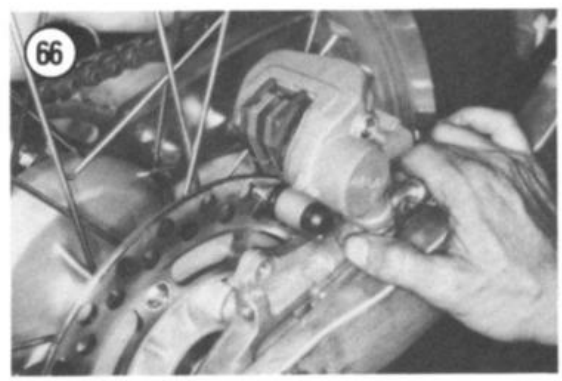


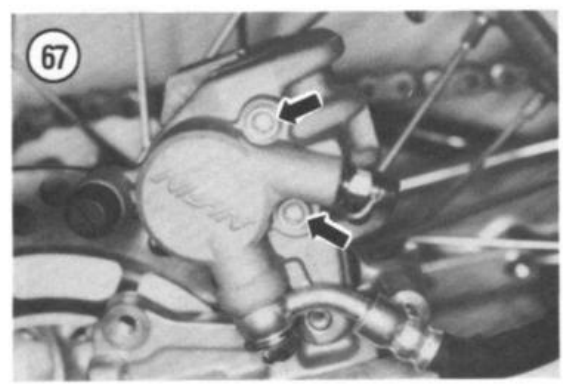
REAR BRAKE CALIPER

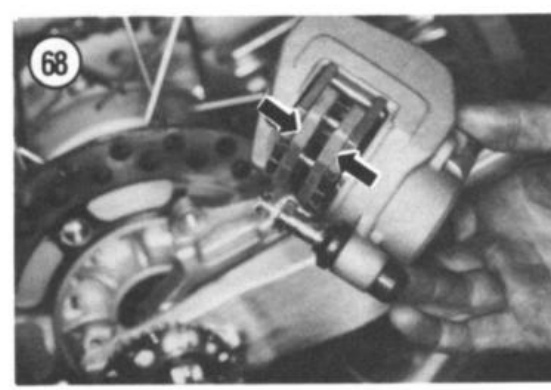
Removal/Installation

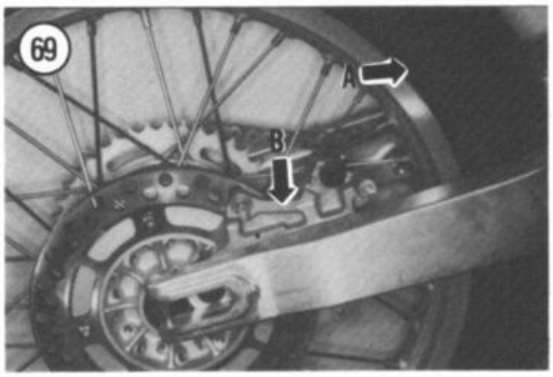
Refer to **Figure 53** for this procedure.

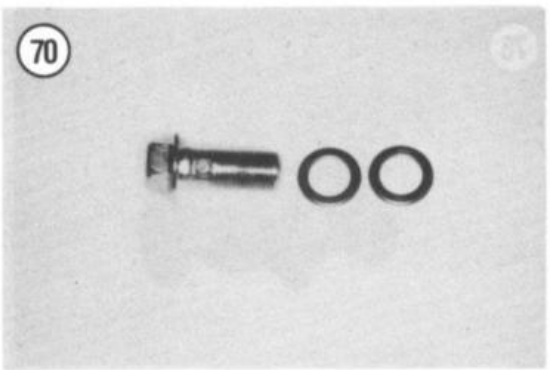
1. Remove the bolts securing the caliper guard (**Figure 56**) and remove the guard.
2. Drain the master cylinder and rear caliper as follows:
   a. Remove the cap (A, **Figure 65**) from the bleed valve.
   b. Attach a hose to the bleed valve on the rear caliper assembly.
   c. Place the loose end of the hose in a container to catch the brake fluid.
   d. Open the bleed valve and continue to apply the rear brake pedal until the brake fluid is pumped out of the system. Dispose of this brake fluid—never reuse brake fluid.
   e. Disconnect the hose and tighten the bleed valve. Install the cap onto the bleed valve.
3. Loosen the brake caliper union bolt (B, **Figure 65**). Remove the union bolt and sealing washers.
4. Unscrew the rear pin (**Figure 60**) from the caliper mounting bracket. The rear pin will stay within the caliper assembly.
5. Pivot the caliper assembly up off the brake disc on the front pin (**Figure 66**).
6. Remove the pad pin bolts (**Figure 67**) and remove the brake pads (**Figure 68**).
7. Pull the caliper off the front pin and remove the caliper assembly from the mounting bracket on the swing arm.
8. To remove the caliper mounting bracket, perform the following:
   a. Remove the rear wheel (A, **Figure 69**) as described in Chapter Eleven.

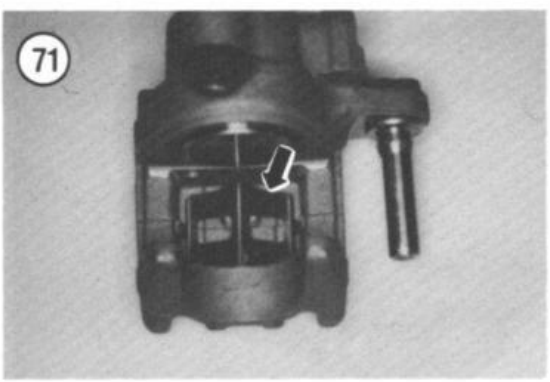












b. Slide the mounting bracket (B, **Figure 69**) off the locating boss on the swing arm and remove the bracket.

9. Install by reversing these removal steps while noting the following:

a. Apply a light coat of Lithium base grease to both pivot pins.

b. Install the brake hose, with a *new* sealing washer (**Figure 70**) on each side of the fitting.

c. Install the union bolt (B, **Figure 65**) and tighten to the torque specification in **Table 2**.

d. Bleed the brake as described in this chapter.

WARNING

Do not ride the motorcycle until you are sure the brake is operating properly.

Disassembly/Inspection/Assembly

Refer to **Figure 53** for this procedure.

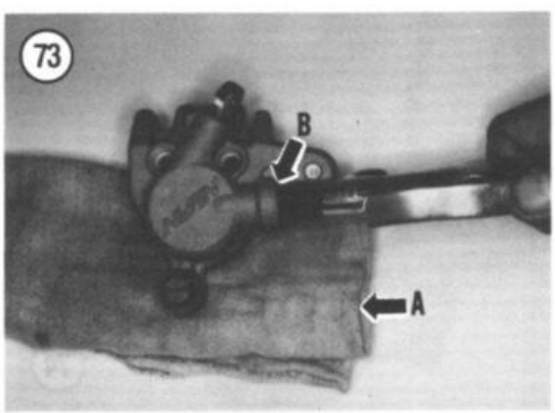
1. Remove the caliper assembly as described in this chapter.

2. Remove the pad spring (**Figure 71**) from the caliper body.

3. Withdraw the piston (**Figure 72**) from the caliper body. If you cannot remove the piston easily, perform the following:

a. Either wrap the caliper body and piston with a heavy cloth or place a shop cloth (A, **Figure 73**) or piece of soft wood over the end of the piston.

b. Perform this step over and close down to a workbench top. Hold the caliper body with the piston facing away from you.



WARNING

In the next step, the piston may shoot out of the caliper body like a bullet. Keep your fingers out of the way. Wear shop gloves and apply air pressure gradually. Do ***not*** *use high pressure air nor place the air hose nozzle directly against the hydraulic fluid passageway in the caliper body. Hold the air nozzle (B,* ***Figure 73****) away from the opening to allow some of the air to escape during the procedure.*

c. Apply the air pressure in short spurts to the hydraulic fluid passageway and force the piston out of the caliper body. Use a service station air hose if you don't have an air compressor.

4. Remove the dust seal (**Figure 74**) from the piston.

5. Use a piece of plastic or wood and carefully push the piston seal (**Figure 75**) in toward the caliper cylinder and out of its groove.

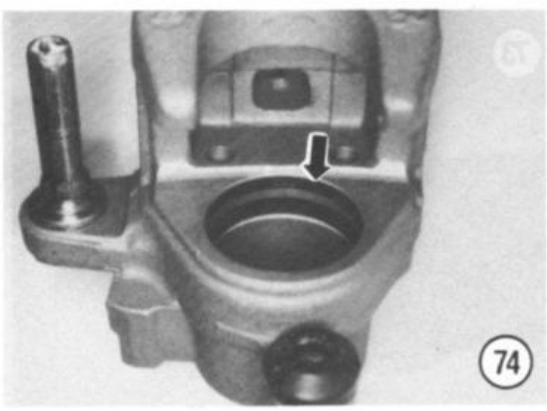
6. Discard the piston seal and dust seal as they cannot be reused after removal as they will no longer seal effectively.

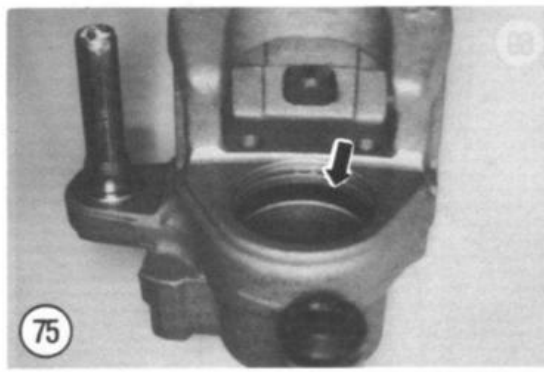
7. Inspect the caliper body (**Figure 76**) for damage, replace the caliper body if necessary.

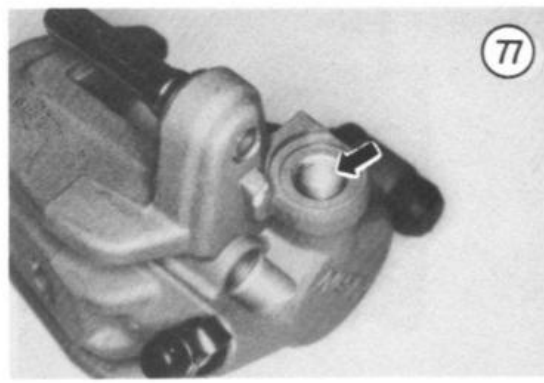
8. Inspect the union bolt hole threads (**Figure 77**). If the threads are slightly damaged; clean them up with a proper size thread tap. If the threads are worn or damaged beyond a "thread clean up," replace the caliper assembly.

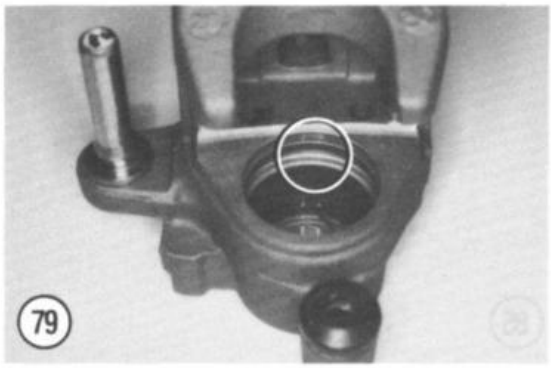
9. Remove the bleed screw from the caliper body.

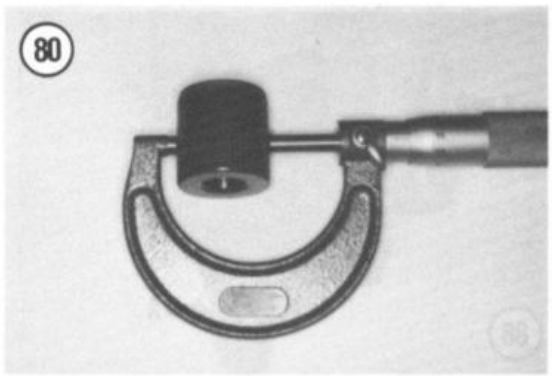
10. Make sure the hole in the bleed screw is clean and open. Apply compressed air to the opening and make sure it is clear. Clean out if necessary with fresh brake fluid.

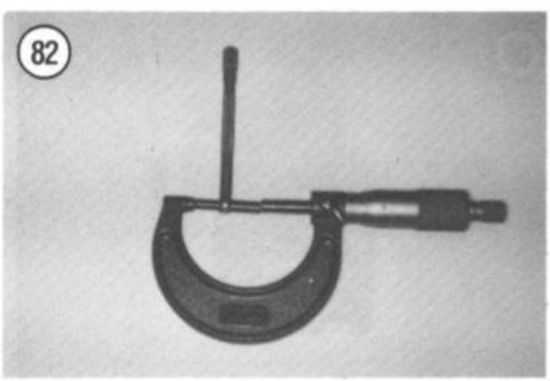












11. Inspect the hydraulic fluid passageway (**Figure 78**) in the base of the cylinder bore. Make sure it is clean and open. Apply compressed air to the opening and make sure it is clear. Clean out if necessary with fresh brake fluid.

12. Inspect the dust seal and piston seal grooves (**Figure 79**) in the caliper body for scoring or other damage. If the grooves are rusty or corroded, replace the caliper assembly.

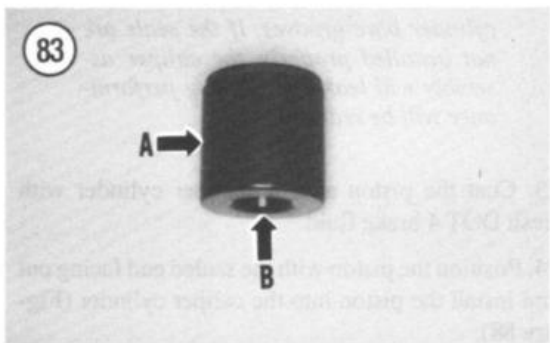
13. Measure the piston outside diameter (**Figure 80**) and compare to the dimension listed in **Table 1**. Replace the caliper assembly if either is worn to the service limit dimension or greater. The piston cannot be replaced separately.

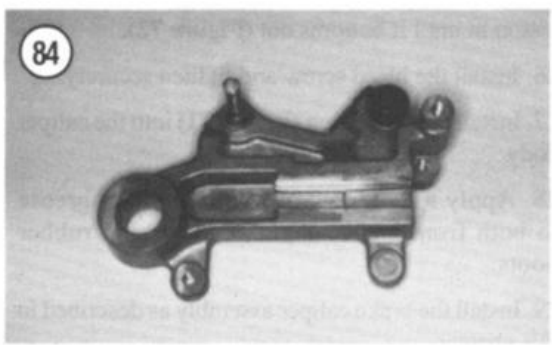
14. Measure the cylinder bore with a small snap hole gauge (**Figure 81**). Then measure the gauge with a micrometer (**Figure 82**) to determine the caliper bore diameter. Replace the caliper assembly if the bore exceeds the specifications given in **Table 1**.

15. Inspect the piston wall (A, **Figure 83**) and end (B, **Figure 83**) for scratches, scoring or other damage. If it is rusty or corroded, replace the piston.

16. If serviceable, clean the caliper body with rubbing alcohol and rinse with clean DOT 4 brake fluid.

17. Inspect the caliper mounting bracket (**Figure 84**) for damage, replace if necessary.





18. Inspect the rubber boot on the bracket (A, **Figure 85**) and caliper (A, **Figure 86**) for wear or deterioration. Replace if necessary.

19. Inspect the front pin (B, **Figure 86**) on the caliper and the rear pin (B, **Figure 85**) on the mounting bracket for scoring, wear or damage. If damaged, replace the pin(s).

20. Inspect the pad retainer (**Figure 87**) on the caliper bracket for wear or damage, replace if necessary.

NOTE

Never reuse a piston or dust seal that has been removed. Very minor damage or age deterioration can make the seal useless.

21. Coat the new dust seal and piston seal with fresh DOT 4 brake fluid.

22. Install the new piston seal (**Figure 75**) and new dust seal (**Figure 74**) into the groove in the caliper assembly. Make sure both seals are properly seated in their grooves.

WARNING

Check that the seals fit squarely in the cylinder bore grooves. If the seals are not installed properly, the caliper assembly will leak and braking performance will be reduced.

23. Coat the piston and the caliper cylinder with fresh DOT 4 brake fluid.

24. Position the piston with the sealed end facing out and install the piston into the caliper cylinder (**Figure 88**).

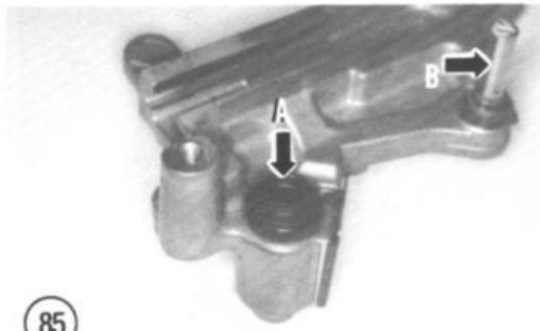
25. Use a suitable size socket and carefully press the piston in until it bottoms out (**Figure 72**).

26. Install the bleed screw and tighten securely.

27. Install the pad spring (**Figure 71**) into the caliper body.

28. Apply a light coat of a Lithium base grease to both front and rear pins and to both rubber boots.

29. Install the brake caliper assembly as described in this chapter.



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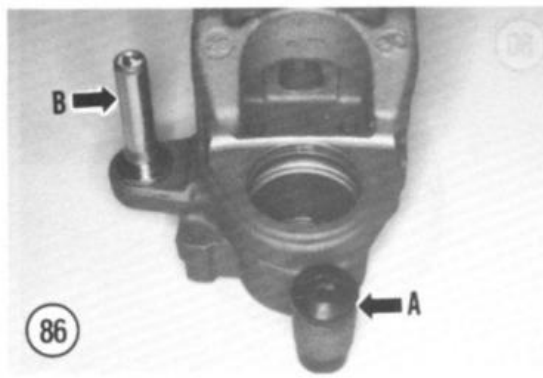

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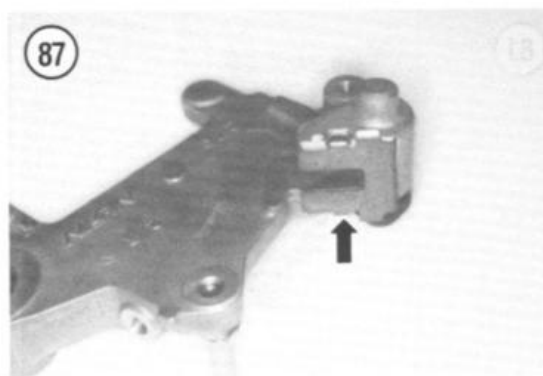
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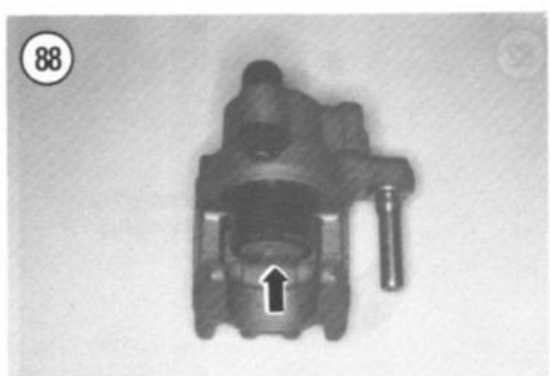
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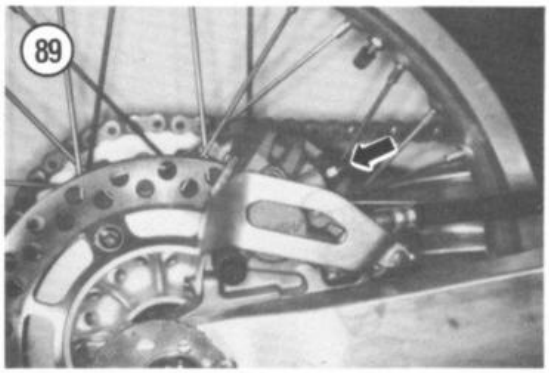
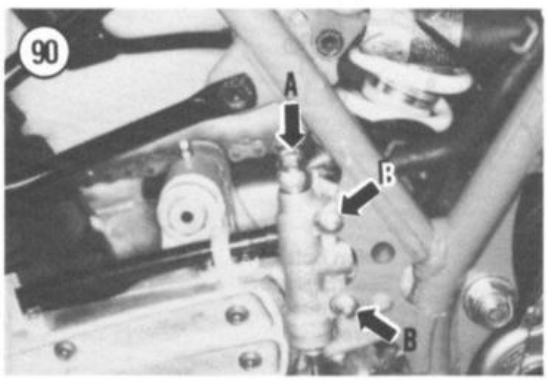
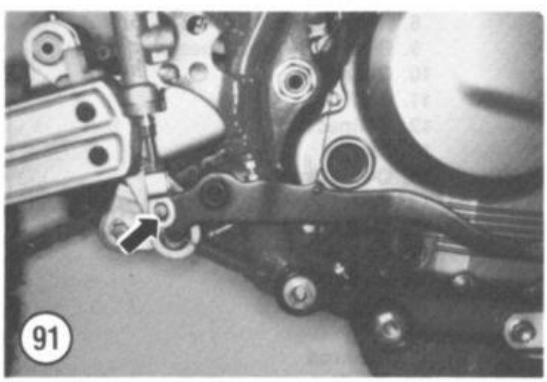
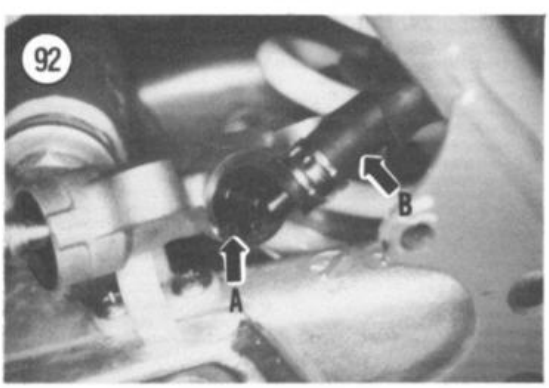








REAR MASTER CYLINDER

Removal/Installation

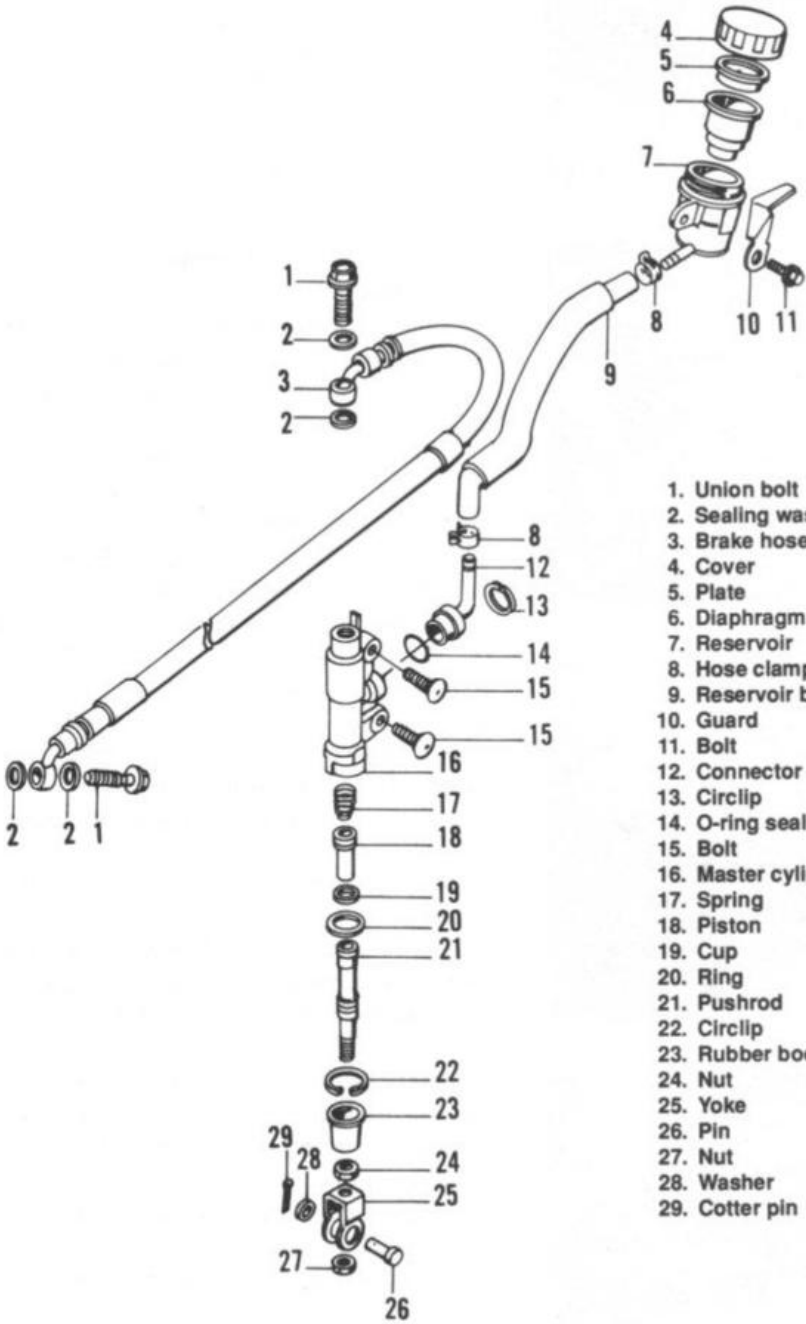
CAUTION

Cover the swing arm with a heavy cloth or plastic tarp to protect it from accidental spilling of brake fluid. Wash any spilled brake fluid off any painted or plated surfaces immediately, as it will destroy the finish. Use soapy water and rinse completely.

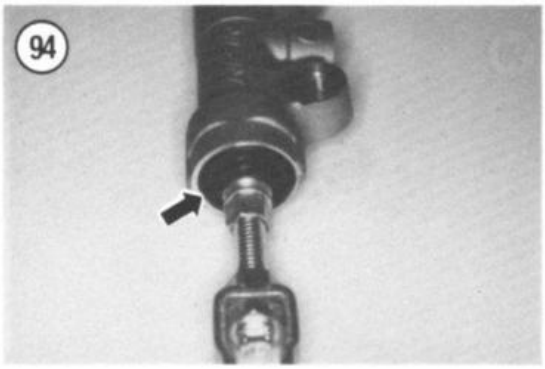
1. Drain the rear master cylinder as follows:
   a. Attach a hose to the brake caliper bleed screw (**Figure 89**).
   b. Place the end of the hose in a clean container.
   c. Open the bleed screw and operate the brake pedal to drain all brake fluid from the master cylinder reservoir.
   d. Close the bleed screw and disconnect the hoses.
   e. Discard the brake fluid.
2. Loosen the union bolt (A, **Figure 90**) securing the brake hose to the master cylinder.
3. Remove cotter pin, slide out the pivot pin (**Figure 91**) and disconnect the master cylinder push rod from the brake pedal.
4. Remove the bolts (B, **Figure 90**) securing the master cylinder to the frame and partially pull the master cylinder away from the frame.
5. Remove the union bolt (A, **Figure 90**), brake hose and both copper sealing washers. Cover the end of the hose to prevent the entry of foreign matter and moisture.
6. Remove the circlip (A, **Figure 92**) securing the reservoir hose connector (B, **Figure 92**) and remove the connector from the backside of the master cylinder.
7. Remove the master cylinder from the frame and take it to the workbench for further disassembly.
8. Install by reversing these removal steps while noting the following:
   a. Inspect the O-ring seal on the connector, replace if necessary.
   b. Install the brake hose into the U-shaped notch in the master cylinder. Be sure to place a *new* copper sealing washer (**Figure 70**) on each side of the hose fitting and install the union bolt. Tighten the union bolt to the specifications in **Table 2**.

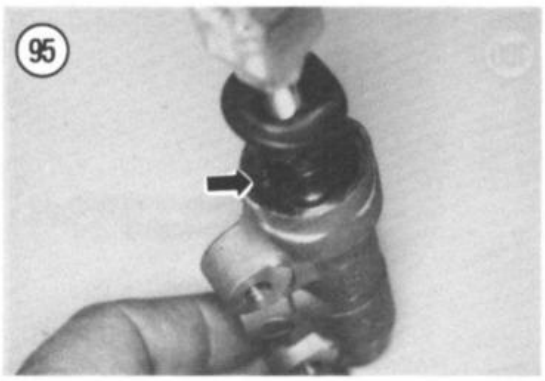
(93)

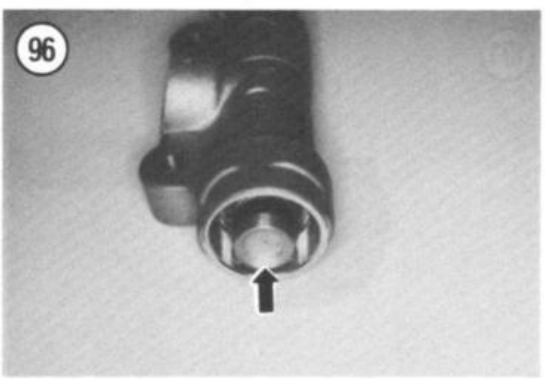
REAR BRAKE MASTER CYLINDER

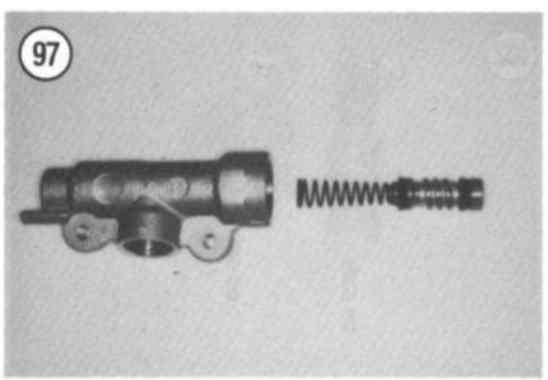


1. Union bolt
2. Sealing washer
3. Brake hose
4. Cover
5. Plate
6. Diaphragm
7. Reservoir
8. Hose clamp
9. Reservoir brake hose
10. Guard
11. Bolt
12. Connector
13. Circlip
14. O-ring seal
15. Bolt
16. Master cylinder body
17. Spring
18. Piston
19. Cup
20. Ring
21. Pushrod
22. Circlip
23. Rubber boot
24. Nut
25. Yoke
26. Pin
27. Nut
28. Washer
29. Cotter pin









c. Tighten the master cylinder mounting bolts to the specifications in **Table 2**.
d. Bleed the brake system as described in this chapter.
e. Adjust the rear brake pedal as described in Chapter Three.

WARNING

Do not ride the motorcycle until you are sure the brakes are operating correctly with full hydraulic advantage. If necessary, bleed the brake as described in this chapter.

Master Cylinder Disassembly/Reassembly

Refer to **Figure 93** for this procedure.

1. Remove the master cylinder as described in this chapter.
2. Slide the dust boot (**Figure 94**) down the push rod.
3. Remove the circlip (**Figure 95**) securing the pushrod assembly.
4. Remove the pushrod, piston (**Figure 96**) and spring from the body.
5. Inspect the master cylinder assembly as described in this chapter.
6. Soak the piston cups and piston assembly in fresh brake fluid for at least 15 minutes to make them pliable. Coat the inside of the cylinder with fresh brake fluid prior to assembling the parts.

CAUTION

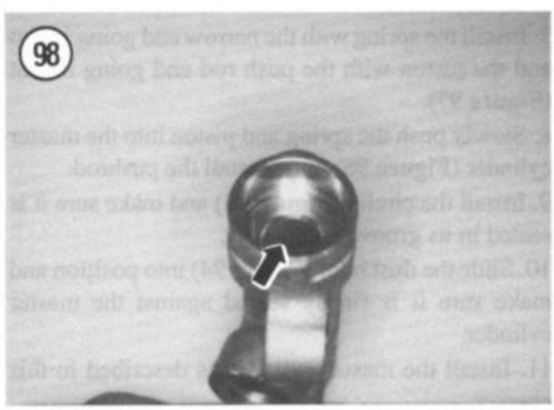
When installing the piston assembly, do not allow the cups to turn inside out as they will be damaged and allow brake fluid to leak within the cylinder bore.

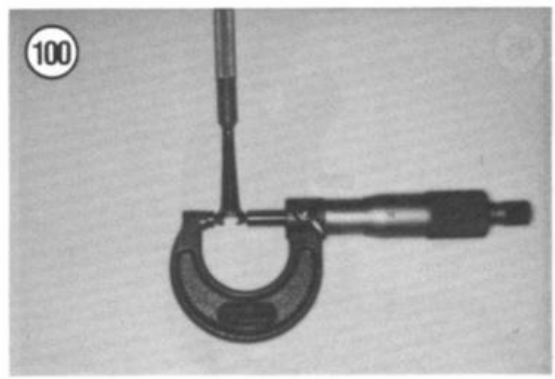
7. Install the spring with the narrow end going in last and the piston with the push rod end going in last (**Figure 97**).
8. Slowly push the spring and piston into the master cylinder (**Figure 96**), then install the pushrod.
9. Install the circlip (**Figure 95**) and make sure it is seated in its groove completely.
10. Slide the dust boot (**Figure 94**) into position and make sure it is firmly seated against the master cylinder.
11. Install the master cylinder as described in this chapter.

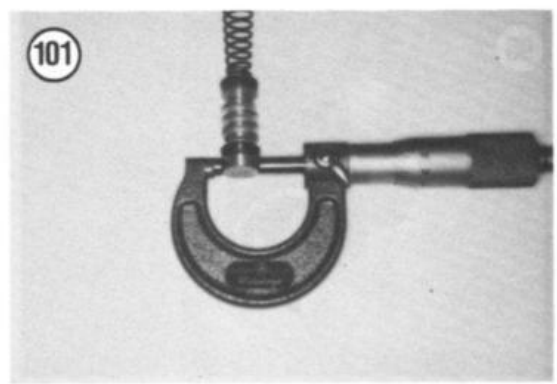
Master Cylinder Inspection

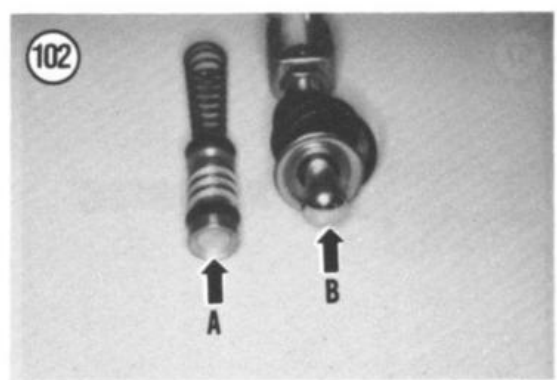
The piston, the spring, the primary and secondary cups and the push rod are all replaced as a kit. Individual parts are not available, if any of these parts are faulty the master cylinder kit must be purchased.

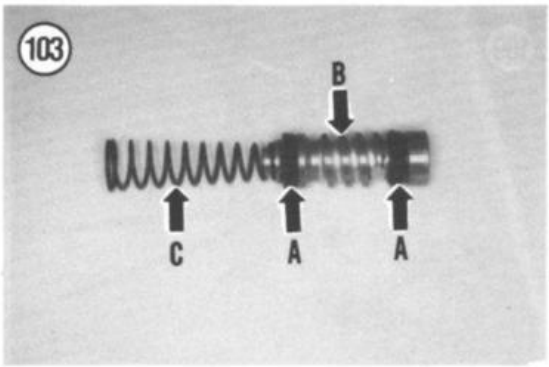
1. Clean all parts in fresh DOT 4 brake fluid. Place the master cylinder components on a clean lint-free cloth when performing the following inspection procedures.
2. Inspect the cylinder bore (**Figure 98**) and piston contact surfaces for signs of wear or damage. If either part is less than perfect, replace it. See Step 11.
3. Measure the cylinder bore with a small snap hole gauge (**Figure 99**). Then measure the gauge with a micrometer (**Figure 100**) to determine the master cylinder bore diameter. Replace the master cylinder assembly if the bore exceeds the specifications given in **Table 1**.
4. Measure the piston outside diameter (**Figure 101**) and compare to the dimension listed in **Table 1**. Replace the master cylinder if it is worn to the service limit dimension or greater. The piston cannot be replaced separately.
5. Check the end of the piston (A, **Figure 102**) where it contacts the pushrod for wear. See Step 11.
6. Check the primary and secondary cups (A, **Figure 103**) for damage, softness or for swollen conditions. See Step 11.
7. Inspect the piston (B, **Figure 103**) and the spring (C, **Figure 103**) for damage or bending. See Step 11.
8. Inspect the end of the push rod where it contacts the piston for damage. See Step 11.

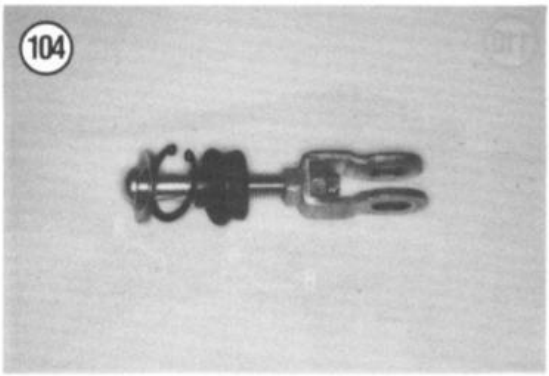


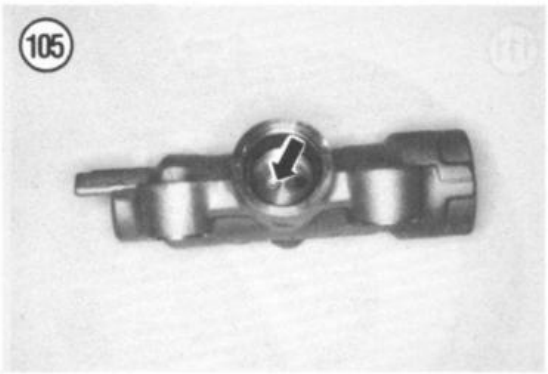


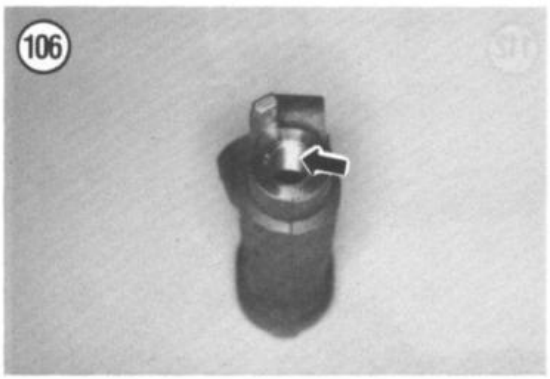










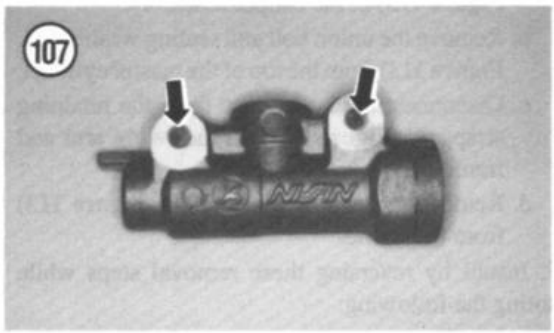


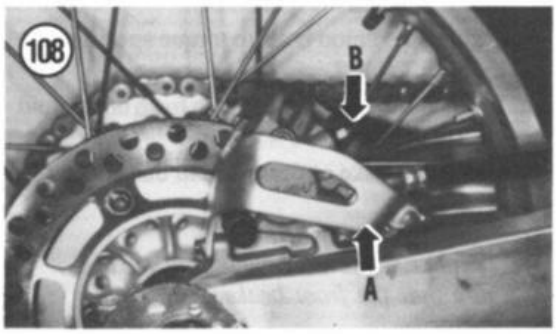
9. Inspect the push rod (B, **Figure 102**) for damage or bending. See Step 11.
10. Inspect the push rod assembly (**Figure 104**) for damage or bending. See Step 11.
11. If any of the parts inspected in Steps 4-9 are worn, damaged or bent, replace all of them with the master cylinder kit.
12. Make sure the inlet passage (**Figure 105**) is clear.
13. Inspect the union bolt threads (**Figure 106**) in the master cylinder body. If the threads are damaged or partially stripped, replace the master cylinder body.
14. Inspect the master cylinder body and mounting bolt holes (**Figure 107**) for cracks or damage. If damaged in any way, replace the master cylinder body.

BRAKE HOSE REPLACEMENT

A brake hose should be replaced whenever it shows signs of cracks, bulges or other damage. The deterioration of rubber by ozone and other atmospheric elements may require replacement every 4 years.

1. Place the bike on the sidestand.
2. Remove the bolts securing the caliper guard (A, **Figure 108**) and remove the guard.





3. Drain the master cylinder and caliper as follows:
   a. Attach a hose to each brake caliper bleed screw. Refer to **Figure 109** for the front brake or B, **Figure 108** for the rear brake.
   b. Place the end of the hose in a clean container.
   c. Open the bleed screw and operate the brake lever or pedal to drain all brake fluid from the master cylinder reservoir and caliper.
   d. Close the bleed screw and disconnect the hoses.
   e. Discard the brake fluid.

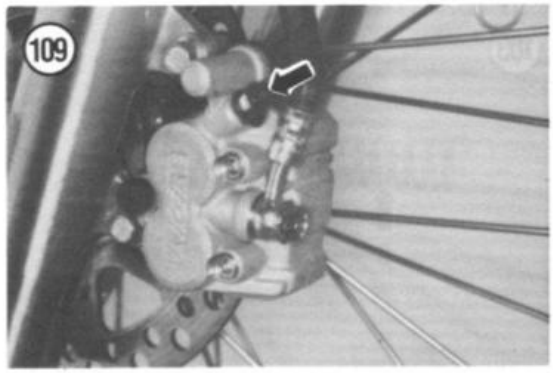
4A. On the front brake system, perform the following:
   a. Slide the rubber boot (A, **Figure 110**) off the union bolt.
   b. Remove the union bolt and sealing washers (B, **Figure 110**) from the master cylinder.
   c. Remove the union bolt and sealing washers (A, **Figure 111**) at the caliper assembly.
   d. Remove the hose clamp (B, **Figure 111**) on the fork slider.
   e. Carefully pull the brake hose up and out of the hose guides (**Figure 112**) on the upper and lower fork bridges.
   f. Remove the front brake hose (C, **Figure 111**) from the frame.

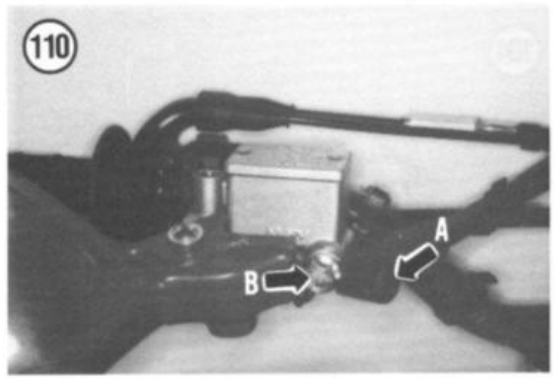
4B. On the rear brake system, perform the following:
   a. Remove the union bolt and sealing washers (A, **Figure 113**) at the caliper assembly.
   b. Remove the union bolt and sealing washers (B, **Figure 113**) from the top of the master cylinder.
   c. Disconnect the brake hose from the retaining straps (C, **Figure 113**) on the swing arm and frame.
   d. Remove the rear brake hose (D, **Figure 113**) from the frame.

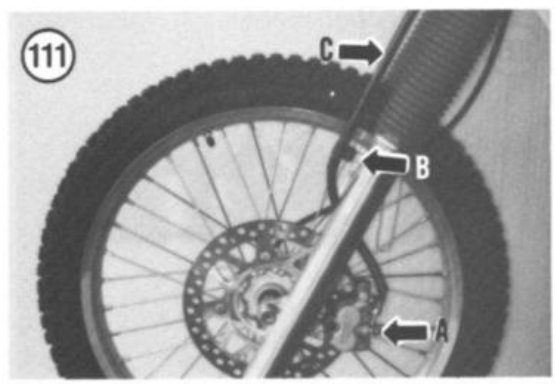
5. Install by reversing these removal steps while noting the following:
   a. Install new sealing washers and if necessary new union bolts (**Figure 114**).
   b. Tighten the union bolts to torque specification listed in **Table 2**.
   c. Refill the master cylinder with fresh brake fluid clearly marked DOT 4.
   d. Bleed the brake as described in this chapter.

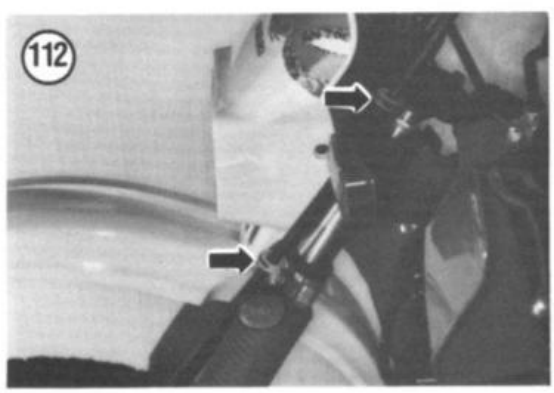
WARNING

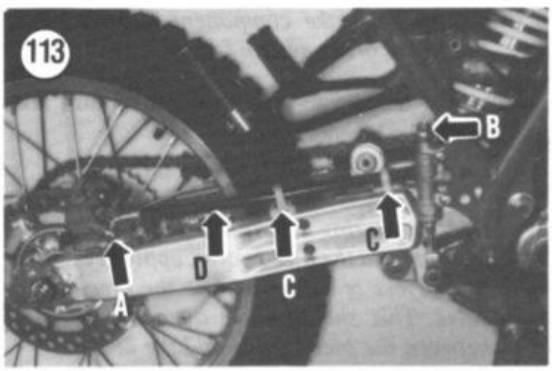
Do not ride the motorcycle until you are sure that the front brake is operating correctly.

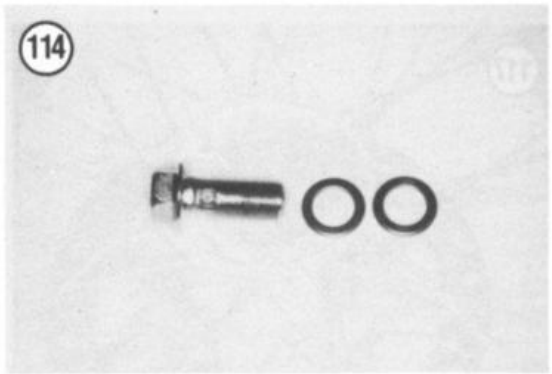


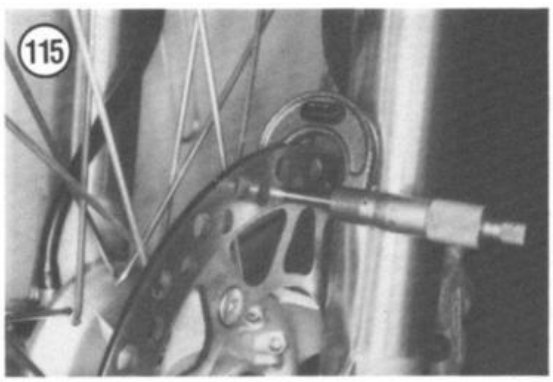


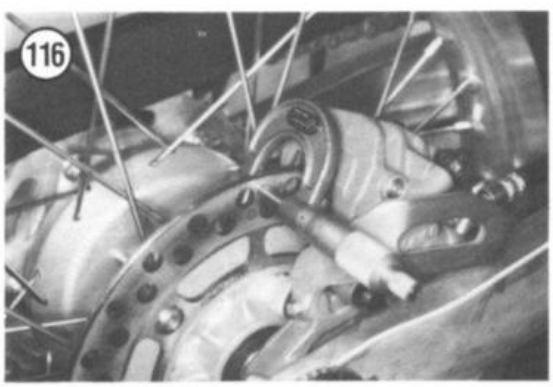












BRAKE DISC

Inspection

It is not necessary to remove the disc from the wheel to inspect it. Small marks on the disc are not important, but radial scratches deep enough to snag a fingernail reduce braking effectiveness and increase brake pad wear. If these grooves are found, the disc should be resurfaced or replaced.

1. Measure the thickness around the disc at several locations with a vernier caliper or a micrometer. Refer to **Figure 115** for the front brake or **Figure 116** for the rear brake. The disc must be replaced if the thicknesses at any point meets or is less than the wear limit listed in **Table 1**.
2. Clean the disc of any rust or corrosion and wipe clean with lacquer thinner. Never use an oil based solvent that may leave an oil residue on the disc.

Removal/Installation

1. Remove the front wheel or rear wheel as described in Chapter Ten (front wheel) or Chapter Eleven (rear wheel).

NOTE

Place a piece of wood or vinyl tube in the caliper in place of the disc. This way, if the brake lever is inadvertently squeezed or the rear brake pedal applied, the piston(s) will not be forced out of the cylinder(s). If this does happen, the caliper might have to be disassembled to reseat the piston and the system will have to be bled. By using the wood, bleeding is not necessary when installing the wheel.

2. On the front wheel, if not already removed, remove the speedometer drive unit (**Figure 117**) and the spacer (**Figure 118**) from the hub.
3. Remove the screws (A, **Figure 119**) securing the disc to the wheel.
4. Remove the disc (B, **Figure 119**) from the hub.
5. Install by reversing these removal steps. Tighten the screws to the specification in **Table 2**.

BLEEDING THE SYSTEM

This procedure is necessary only when the brakes feel spongy, there is a leak in the hydraulic system,

a component has been replaced or the brake fluid has been replaced.

If the entire front or rear brake system was drained of all brake fluid you may have trouble getting all of the bubbles out of the system due to the long length of the hoses. If this problem exists, refer to the *Reverse Flow Bleeding* procedure at the end of this section.

Brake Bleeder Process

This procedure uses a brake bleeder that is available from motorcycle or automotive supply stores or from mail order outlets.

1. Remove the dust cap from the bleed valve on the caliper assembly. Refer to **Figure 109** for the front brake or B, **Figure 108** for the rear brake.

2. Connect the brake bleeder to the bleed valve on the caliper assembly following the manufacturer's instructions.

CAUTION

Cover the wheel with a heavy cloth or plastic tarp to protect it from the accidental spilling of brake fluid. Wash any brake fluid off of any plastic, painted or plated surface immediately; as it will destroy the finish. Use soapy water and rinse completely.

3. Clean the top cover or cap of the master cylinder of all dirt and foreign matter.

4A. On the front brake, remove the screws securing the master cylinder top cover (**Figure 120**) and remove the reservoir top cover and diaphragm.

4B. On the rear brake, remove the bolt (A, **Figure 121**) securing the reservoir and guard. Remove the cap, plate and diaphragm (B, **Figure 121**).

5. Fill the reservoir almost to the top lip; insert the diaphragm and the cover, or cap, loosely. Leave the cover, or cap, in place during this procedure to prevent the entry of dirt.

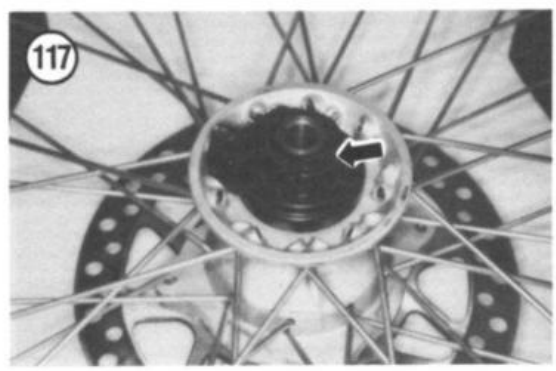
WARNING

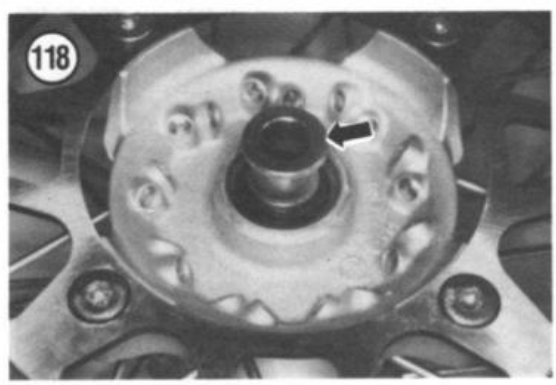
Use brake fluid from a sealed container marked DOT 4 only (specified for disc brakes). Other types may vaporize and cause brake failure. Do not intermix different brands or types as they may not be compatible. Do not intermix a silicone-based (DOT 5) brake fluid as it can cause brake component damage leading to brake system failure.

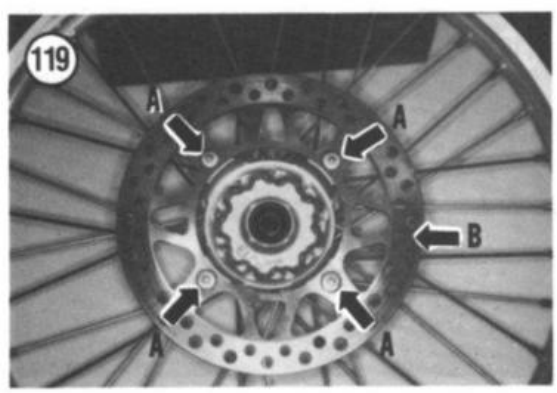
6. Open the bleed valve about one-half turn and pump the brake bleeder.

NOTE

If air is entering the brake bleeder hose from around the bleed valve, apply several layers of Teflon tape to the bleed valve. This should make a good seal between the bleed valve and the brake bleeder hose.







7. As the fluid enters the system and exits into the brake bleeder, the level will drop in the reservoir. Maintain the level to just about the top of the reservoir to prevent air from being drawn into the system.
8. Continue to pump the lever on the brake bleeder until the fluid emerging from the hose is completely free of bubbles.
9. Tap on the brake hoses to help free any bubbles stuck to the walls of the hoses.

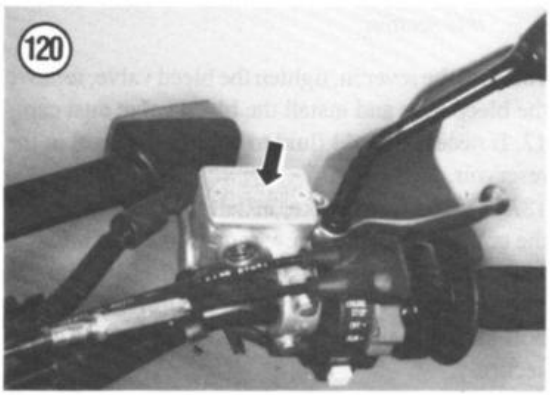
NOTE

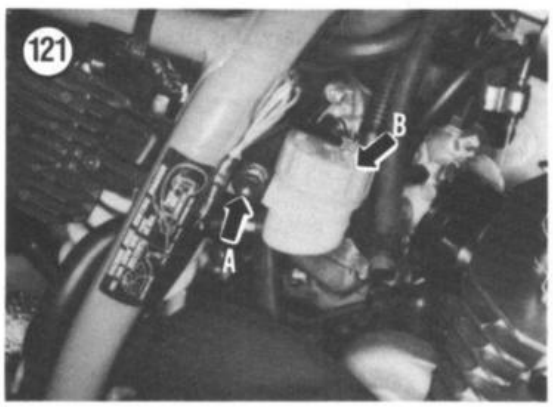
Do not allow the reservoir to empty during the bleeding operation or more air will enter the system. If this occurs, the entire procedure must be repeated.

NOTE

If you are having trouble getting all of the bubbles out of the system, refer to the ***Reverse Flow Bleeding*** *at the end of this section.*

10. When the brake fluid is free of bubbles, tighten the bleed valve, remove the brake bleeder tube and install the bleed valve dust cap.





11. If necessary, add fluid to correct the level in the reservoir. It should be to the upper level line.
12A. On the front brake, install the diaphragm and the cover. Install the screws and tighten securely.
12B. On the rear brake, install the diaphgram, plate and cap. Tighten the cap securely. Install the bolt securing the reservoir and guard and tighten securely.
13. Test the feel of the brake lever or pedal. It should be firm and should offer the same resistance each time it's operated. If it feels spongy, it is likely that there is still air in the system and it must be bled again. When all air has been bled from the system and the fluid level is correct in the reservoir, double-check for leaks and tighten all fittings and connections.

WARNING

Before riding the bike, make certain that the brake is operating correctly by operating the lever several times.

14. Test ride the bike slowly at first to make sure that the brakes are operating properly.

Without a Brake Bleeder

1. Remove the dust cap from the bleed valve on the caliper assembly. Refer to **Figure 109** for the front brake or B, **Figure 108** for the rear brake.
2. Connect a piece of clear tubing to the bleed valve on the caliper assembly.

CAUTION

Cover the wheel with a heavy cloth or plastic tarp to protect it from the accidental spilling of brake fluid. Wash any brake fluid off of any plastic, painted or plated surface immediately; as it will destroy the finish. Use soapy water and rinse completely.

3. Clean the top cover or cap of the master cylinder of all dirt and foreign matter.
4A. On the front brake, remove the screws securing the master cylinder top cover (**Figure 120**) and remove the reservoir top cover and diaphragm.
4B. On the rear brake, remove the bolt (A, **Figure 121**) securing the reservoir and guard. Remove the cap, plate and diaphragm (B, **Figure 121**).
5. Fill the reservoir almost to the top lip; insert the diaphragm and the cover, or cap, loosely. Leave the

cover, or cap, in place during this procedure to prevent the entry of dirt.

6. Place the other end of the tube into a clean container.

7. Fill the container with enough fresh brake fluid to keep the end submerged.

8. Fill the reservoir almost to the cover lip; insert the diaphragm and the cover, or cap, loosely. Leave the cover, or cap, in place during this procedure to prevent the entry of dirt.

WARNING

Use brake fluid from a sealed container marked DOT 4 only (specified for disc brakes). Other types may vaporize and cause brake failure. Do not intermix different brands or types as they may not be compatible. Do not intermix a silicone based (DOT 5) brake fluid as it can cause brake component damage leading to brake system failure.

NOTE

During this procedure, it is very important to check the fluid level in the brake master cylinder reservoir often. If the reservoir runs dry, you'll introduce more air in the system which will require starting over.

9. If the master cylinder was drained, it must be bled first. Remove the union bolt and hose from the master cylinder. Slowly apply the brake lever, or pedal, several times while holding your thumb over the opening in the master cylinder and perform the following:

a. With the lever, or pedal, applied, slightly release your thumb pressure. Some of the brake fluid and air bubbles will escape.
b. Apply thumb pressure and pump lever once more.
c. Repeat this procedure until you can feel resistance at the lever.

10. Quickly reinstall the hose, sealing washers and the union bolt. Refill the master cylinder.

11. Tighten the union bolt and pump the lever again and perform the following:

a. Loosen the union bolt 1/4 turn. Some brake fluid and air bubbles will escape.
b. Tighten the union bolt and repeat this procedure until no air bubbles escape.

12. Tighten the union bolts to the torque specification listed in **Table 2**.

13. Slowly apply the brake lever several times as follows:

a. Pull the lever in and hold it in the applied position.
b. Open the bleed valve about one-half turn. Allow the lever to travel to its limit.
c. When this limit is reached, tighten the bleed valve.

14. As the fluid enters the system, the level will drop in the reservoir. Maintain the level to just about the top of the reservoir to prevent air from being drawn into the system.

15. Continue to pump the lever and fill the reservoir until the fluid emerging from the hose is completely free of bubbles.

NOTE

Do not allow the reservoir to empty during the bleeding operation or more air will enter the system. If this occurs, the entire procedure must be repeated.

NOTE

If you are having trouble getting all of the bubbles out of the system, refer to the ***Reverse Flow Bleeding*** *at the end of this section.*

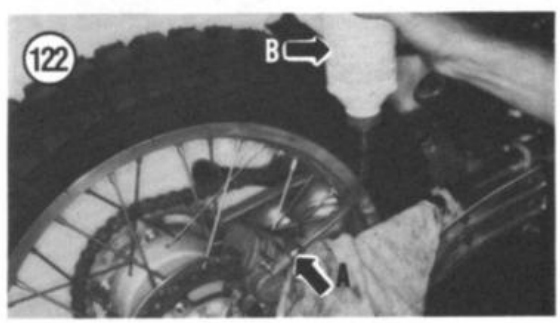
16. Hold the lever in, tighten the bleed valve, remove the bleed tube and install the bleed valve dust cap.

17. If necessary, add fluid to correct the level in the reservoir.

18A. On the front brake, install the diaphragm and the cover. Install the screws and tighten securely.

18B. On the rear brake, install the diaphgram, plate and cap. Tighten the cap securely. Install the bolt securing the reservoir and guard and tighten securely.

19. Test the feel of the brake lever. It should be firm and should offer the same resistance each time it's operated. If it feels spongy, it is likely that there is



still air in the system and it must be bled again. When all air has been bled from the system and the fluid level is correct in the reservoir, double-check for leaks and tighten all fittings and connections.

WARNING

Before riding the bike, make certain that the brakes are operating correctly. Spin the front wheel and apply the lever several times. The wheel must come to a complete stop each time.

20. Test ride the bike slowly at first to make sure that the brakes are operating properly.

Reverse Flow Bleeding

This bleeding procedure can be used if you are having a difficult time freeing the system of all bubbles.

Using this procedure, the brake fluid will be forced into the system in a reverse direction. The fluid will enter the caliper, flow through the brake hose(s) and into the master cylinder reservoir. If the system is already filled with brake fluid, the existing fluid will be flushed out of the top of the master cylinder by the new brake fluid being forced into the caliper. Siphon the fluid from the reservoir, then hold a shop cloth under the master cylinder reservoir to catch any addition fluid that will be forced out.

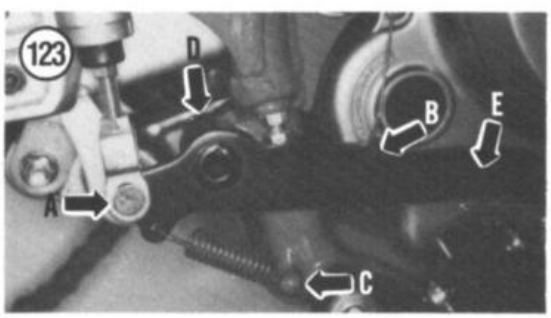
An easy-to-make special tool is necessary for this procedure.

To make this special tool, perform the following:

NOTE

The brake fluid container must be plastic—not metal. Use vinyl tubing of the correct inner diameter to ensure a tight fit on the caliper bleed valve.

a. Purchase a 10-12 oz. *plastic* bottle of DOT 4 brake fluid.



b. Remove the cap, drill an appropriate size hole and adapt a vinyl hose fitting onto the cap.
c. Attach a section of vinyl hose to the hose fitting on the cap and secure it with a hose clamp. This joint must be a tight fit as the plastic brake fluid bottle will be squeezed to force the brake fluid out past this fitting and through the hose.
d. Remove the moisture seal from the plastic bottle of brake fluid and screw the cap and hose assembly onto the bottle.

1. Remove the dust cap from the bleed valve on the caliper assembly. Refer to **Figure 109** for the front brake or B, **Figure 108** for the rear brake.
2. Clean the top cover or cap of the master cylinder of all dirt and foreign matter.
3A. On the front brake, remove the screws securing the master cylinder top cover (**Figure 120**) and remove the reservoir top cover and diaphragm.
3B. On the rear brake, remove the bolt (A, **Figure 121**) securing the reservoir and guard. Remove the cap, plate and diaphragm (B, **Figure 121**).
4. Attach the vinyl hose to the bleed valve on the caliper (A, **Figure 122**). Make sure the hose is tight on the bleed valve.
5. Open the bleed valve and squeeze the plastic bottle (B, **Figure 122**) forcing this brake fluid into the system.

NOTE

If necessary, siphon brake fluid from the reservoir to avoid overflow of fluid.

6. Observe the brake fluid entering the master cylinder reservoir. Continue to squeeze the bottle until the fluid entering the reservoir is free of all air bubbles.
7. Close the bleed valve and disconnect the hose from the bleed valve.
8. At this time the system should be free of bubbles. Apply the brake lever or pedal and check for proper brake operation. If the system still feels spongy, perform the typical bleeding procedure in the beginning of this section.

REAR BRAKE PEDAL

Removal/Installation

1. Support the bike on the sidestand.
2. Remove the cotter pin, washer and pivot pin (A, **Figure 123**) securing the master cylinder pushrod yoke to the brake pedal.

3. Use needlenose pliers and disconnect the brake light switch spring (B, **Figure 123**) from the brake pedal.
4. Use vise-grip pliers and disconnect the brake pedal return spring from the post on the frame (C, **Figure 123**).
5. On the backside of the brake pedal pivot post (D, **Figure 123**), remove the cotter pin, washer and inner dust seal from the pivot post.
6. Pull the rear brake pedal (E, **Figure 123**) from the frame. Make sure the outer dust seal is still in place on the pivot post.
7. Inspect the inner and outer dust seals for damage and deterioration, replace if necessary.
8. Install by reversing these removal steps while noting the following:
   a. Make sure outer dust seal is in place on the brake pedal pivot post.
   b. Apply multipurpose grease to the brake pedal pivot post and the pivot post receptacle on the frame.
   c. Be sure to install the inner dust seal on the pivot post prior to installing the washer and cotter pin.
   d. Use a new cotter pin and bend the ends over completely.

Table 1 DISC BRAKE SERVICE SPECIFICATIONS

Item	Specifications mm (in.)	Wear limit mm (in.)
Brake disc		
Thickness		
Front	3.3-3.7 (0.130-0.146)	3.0 (0.118)
Rear	3.8-4.2 (0.149-0.165)	3.5 (0.138)
Runout	—	0.30 (0.012)
Brake pad thickness	—	0.8 (0.03)
Front master cylinder bore inside diameter		
DR250 and DR350	11.000-11.043 (0.4331-0.4348)	—
DR250S and DR350S	12.700-12.743 (0.5000-0.5017)	—
Front master cylinder piston outside diameter		
DR250 and DR350	10.957-10.984 (0.4314-0.4324)	—
DR250S and DR350S	12.657-12.684 (0.4983-0.4994)	—
Rear master cylinder bore inside diameter	12.700-12.743 (0.5000-0.5017)	—
Rear master cylinder piston outside diameter	12.657-12.684 (0.4983-0.4994)	—
Front caliper cylinder bore inside diameter	27.000-27.050 (1.0630-1.0650)	—
Front caliper piston outside diameter	26.900-26.950 (1.0591-1.0610)	—
Rear caliper cylinder bore inside diameter		
DR250 and DR350	27.000-27.050 (1.0630-1.0650)	—
DR250S and DR350S	30.230-30.280 (1.1902-1.1921)	—
Rear caliper piston outside diameter		
DR250 and DR350	26.900-26.950 (1.0591-1.0610)	—
DR250S and DR350S	30.160-30.180 (1.1874-1.1882)	—

Table 2 BRAKE TIGHTENING TORQUES

Item	N•m	ft.-lb.
Front caliper		
Mounting bolts	20-31	14.5-22.5
Pad pin bolt	15-20	11-14.5
Rear master cylinder mounting bolts	8-12	6-8.5
Brake hose union bolts	20-25	14.5-18.0
Bleed screws	6-9	4.6-6.5
Brake disc mounting bolts	18-28	13-20

CHAPTER THIRTEEN

FRAME AND BODY

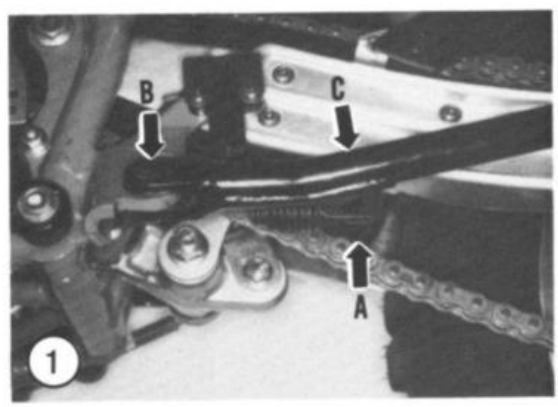
This chapter includes replacement procedures for components attached to the frame that are not covered in the rest of the book.

This chapter also describes procedures for completely stripping and repainting the frame.

SIDESTAND

Removal/Installation

1. Place the bike on a support with the rear wheel off the ground.
2. Raise the sidestand.
3. Disconnect the dual return springs (A, **Figure 1**) from the frame post with vise-grip pliers.
4. Remove the pivot bolt (B, **Figure 1**) and nut and remove the kickstand (C, **Figure 1**) from the frame. Discard the nut as it cannot be reused.
5. Install by reversing these removal steps while noting the following:
   a. Apply a light coat of multipurpose grease to all pivot surfaces prior to installation.
   b. Install a new self-locking nut and tighten the bolt and nut securely.

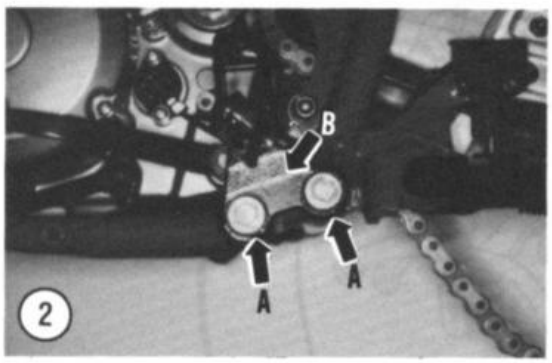


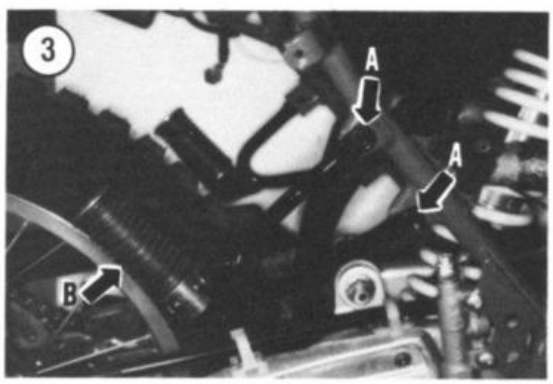
c. Be sure to reconnect *both* return springs onto the frame post.

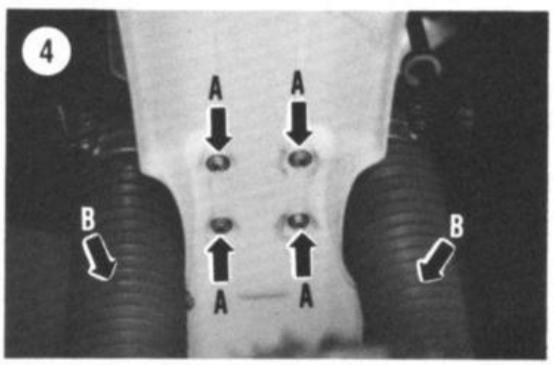
FOOTPEGS

Front Footpeg
Removal/Installation

1. Place the bike on the sidestand.
2. To remove only the footpeg from the footpeg bracket, perform the following:
   a. Remove the cotter pin from the pivot pin.







   b. Remove the footpeg and spring from the bracket.
3. To remove the footpeg and bracket assembly, perform the following:
   a. Remove the bolts (A, **Figure 2**) securing the footpeg assembly to the frame.
   b. Remove the footpeg assembly (B, **Figure 2**).
4. Install by reversing these removal steps while noting the following:
   a. Lubricate all pivot points prior to installation.
   b. Tighten the rear footpeg assembly mounting bolts securely.
   c. Install new cotter pins and bend the ends over completely.

Rear Footpegs (DR250S and DR350S)
Removal/Installation

NOTE
DR250 and DR350 models are not equipped with rear footpegs.

1. Place the bike on the sidestand.
2. To remove only the footpeg from the footpeg bracket, perform the following:
   a. Remove the cotter pin from the pivot pin.
   b. Remove the footpeg and washer from the bracket.
3. To remove the footpeg and bracket assembly, perform the following:
   a. Remove the bolts (A, **Figure 3**) securing the footpeg assembly to the frame.
   b. Remove the footpeg assembly (B, **Figure 3**).
4. Install by reversing these removal steps while noting the following:
   a. Lubricate all pivot points prior to installation.
   b. Tighten the rear footpeg assembly mounting bolts securely.
   c. Install new cotter pins and bend the ends over completely.

FENDERS

Front Fender
Removal/Installation

1. Remove the front wheel as described in Chapter Ten.
2. Remove the bolts (A, **Figure 4**) securing the front fender to the lower fork bridge.

3. Carefully side the front fender down being careful not to damage the dust boots (B, **Figure 4**) on each side.

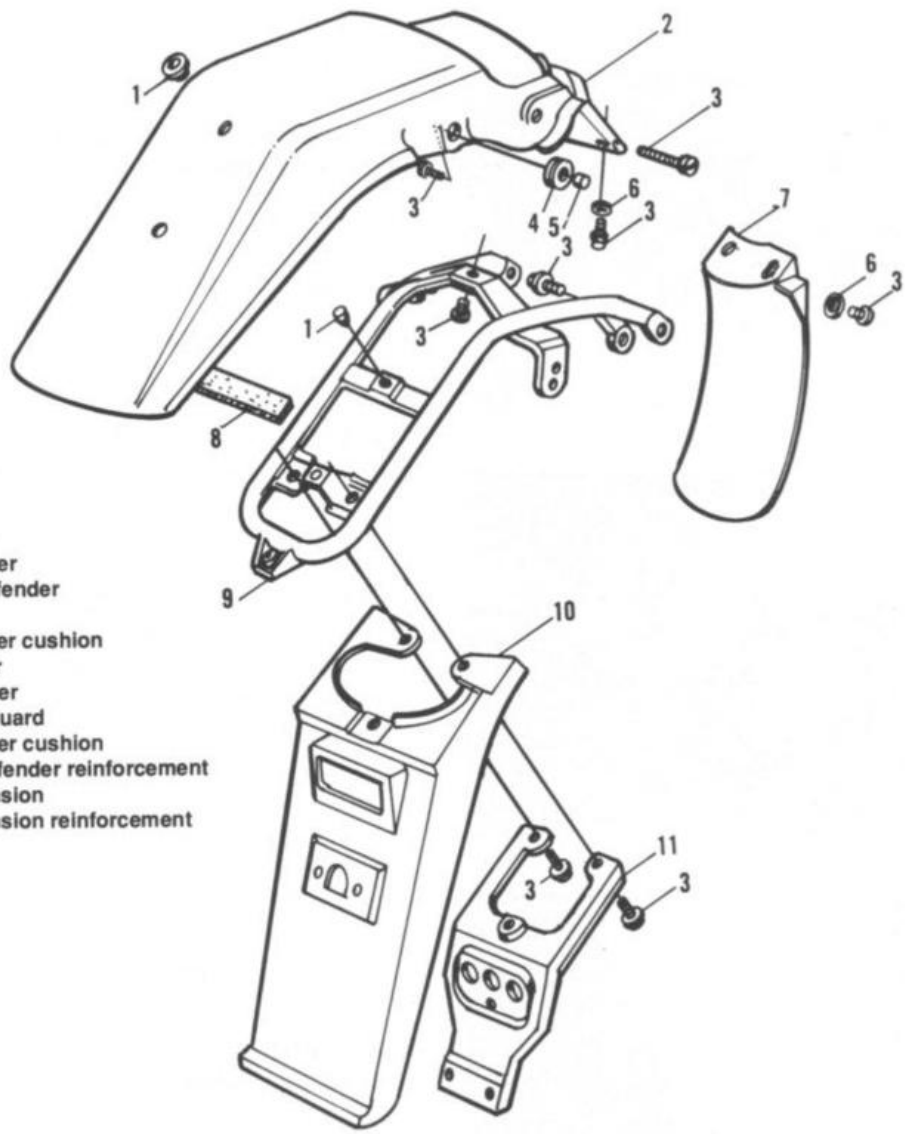
4. Remove the front fender. Don't lose the special metal washer on each side of the mounting holes in the fender.

5. Install by reversing these removal steps while noting the following:

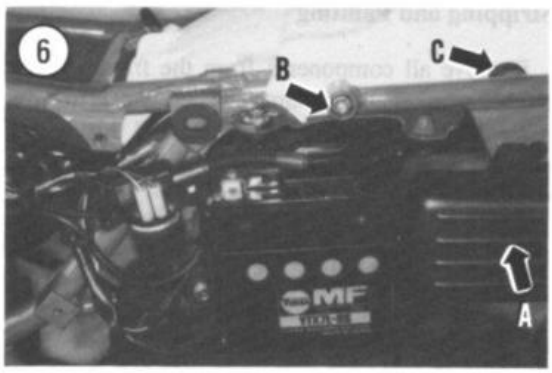
a. Be sure to install the special metal washer (on each side) in the fender mounting holes in the fender on each side. If the washers are not in place and the bolts are tightened, the fender

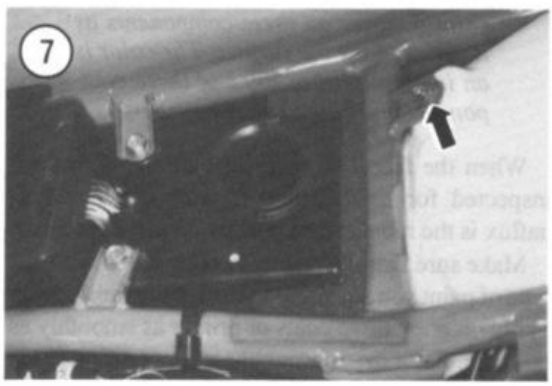
5

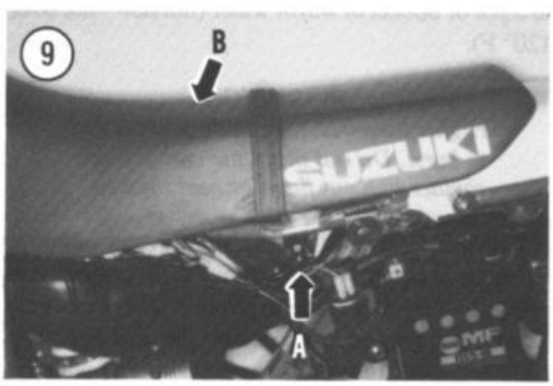
REAR FENDER



1. Washer
2. Rear fender
3. Bolt
4. Rubber cushion
5. Collar
6. Washer
7. Mudguard
8. Rubber cushion
9. Rear fender reinforcement
10. Extension
11. Extension reinforcement







mounting areas will be damaged and the fender will have to be replaced.

b. Apply a *small* amount of blue Loctite (No. 242) to the fender mounting bolts prior to installation.

c. Tighten the bolts securing the fender securely. Don't over tighten the bolts as the fender mounting areas may be damaged even with the special metal washers in place.

Rear Fender
Removal/Installation

Refer to **Figure 5** for this procedure.

1. Remove the rear wheel as described in Chapter Eleven.
2. Remove the frame side covers and seat as described in this chapter.
3. Disconnect the electrical connector from the taillight assembly.
4. On DR250S and DR350S models, disconnect the electrical connectors to the rear turn signals.
5. Remove screws securing the tool carrier (A, **Figure 6**) and remove it from the left-hand side of the rear grip.
6. Remove the front bolts (B, **Figure 6**) securing the rear grip, fender and reinforcement to the frame.
7. Working under the fender, remove the rear bolts (C, **Figure 6**) securing the rear grip, rear fender and reinforcement to the frame.
8. Remove the front screw (under the fender) and washer (**Figure 7**) securing the front of the fender to the frame.
9. Make sure all mounting bolts and nuts are removed and remove the rear fender, reinforcement and extension assembly from the frame.
10. Install by reversing these removal steps. Tighten the bolts and nuts securing the fender securely. Don't over tighten the nuts as the fender may be damaged.

13

SEAT

Removal/Installation

1. Place the bike on the sidestand.
2. Remove the frame right- and left-hand side covers (**Figure 8**).
3. Remove the bolt and washer (A, **Figure 9**) on each side securing the seat frame at the rear.

4. Lift up on the rear of the seat and pull it toward the rear to release it from the locking tab on the frame at the front.
5. Remove the seat (B, **Figure 9**) from the frame.
6. Be sure to push and lock the front of the seat into the locking tab at the front and make sure it is properly located. If the seat is not properly secured at the front it could swing to one side when riding the bike, resulting in a possible accident.
7. Make sure the bolts are installed correctly and tightened securely. If they should work loose and fall out, the seat will become loose and unstable, resulting in a possible accident.
8. Install the frame right- and left-hand side covers.

FRAME

The frame does not require routine maintenance. However, it should be inspected immediately after any accident or spill.

Component Removal/Installation

1. Remove both side covers and the seat as described in this chapter.
2. Remove the front and rear fender as described in this chapter.
3. Remove the fuel tank as described in Chapter Eight.
4. Remove the battery as described in Chapter Three.
5A. On DR250 and DR350 models, remove the trip meter as described in Chapter Eight.
5B. On DR250S and DR350S models, remove the instrument cluster as described in Chapter Eight.
6. Remove the hydraulic brake system flexible hose as described in Chapter Twelve.
7. Remove the wiring harness from the frame.
8. Remove the front wheel, handlebar, steering head and front forks as described in Chapter Ten.
9. Remove the rear wheel, shock absorber and swing arm as described in Chapter Eleven.
10. Remove the engine and transmission housing as described in Chapter Four.
11. Remove the steering head races from the steering head tube as described in Chapter Ten.
12. Inspect the frame for bends, cracks or other damage, especially around welded joints and areas that are rusted.
13. Assemble by reversing these removal steps.

Stripping and Painting

Remove all components from the frame. Thoroughly strip off all old paint. The best way is to have it sandblasted down to bare metal. If this is not possible, you can use a liquid paint remover and steel wool and a fine, hard wire brush.

CAUTION

Some of the fenders, side covers and air box are molded plastic. If your wish to change the color of these parts, consult an automotive paint supplier for the proper procedure. Do not use any liquid paint remover on these components as it will damage the surface. The color is an integral part of some of these components and cannot be removed.

When the frame is down to bare metal, have it inspected for hairline and internal cracks. Magnaflux is the most common and complete process.

Make sure that the primer is compatible with the type of paint you are going to use for the finish color. Spray on one or two coats of primer as smoothly as possible. Let it dry thoroughly and use a fine grade of wet sandpaper (400-600 grit) to remove any flaws. Carefully wipe the surface clean and then spray a couple of coats of the final color. Use either lacquer or enamel base paint and follow the manufacturer's instructions.

A shop specializing in painting will probably do the best job. However, you can do a surprisingly good job with a good grade of spray paint. Spend a few extra dollars and get a good grade of paint as it will make a difference in how well it looks and how long it will stand up. It's a good idea to shake the can and make sure the ball inside the can is loose when you purchase the can of paint. Shake the can as long as is stated on the can. Then immerse the can *upright* in a pot or bucket of *warm* water (not hot—not over 120° F).

WARNING

Higher temperatures could cause the can to burst. Do ***not*** *place the can in direct contact with any flame or heat source.*

Leave the can in the water for several minutes. When thoroughly warmed, shake the can again and spray the frame. Be sure to get into all the crevices where there may be rust problems. Several light mist coats are better than one heavy coat. Spray painting

is best done in temperatures of 70-80° F (21-26° C); any temperature above or below this will give you problems.

After the final coat has dried completely, at least 48 hours, any over spray or orange peel may be removed with a *light* application of Dupont rubbing compound (red color) and finished with Dupont polishing compound (white color). Be careful not to rub too hard or you will go through the finish. Finish off with a couple coats of good wax prior to reassembling all the components.

It's a good idea to keep the frame touched up with fresh paint if any minor rust spots, chips or scratches appear.

An alternative to painting is powder coating. The process involves spraying electrically charged particles of pigment and resin on the object to be coated, which is negatively charged. The charged powder particles adhere to the electrically grounded object until heated and fused into a smooth coating in a curing oven. Powder coated surfaces are more resistant to chipping, scratching, fading and wearing than other finishes. A variety of colors and textures are available. Powder coating also has advantages over paint as no environmentally hazardous solvents are used.

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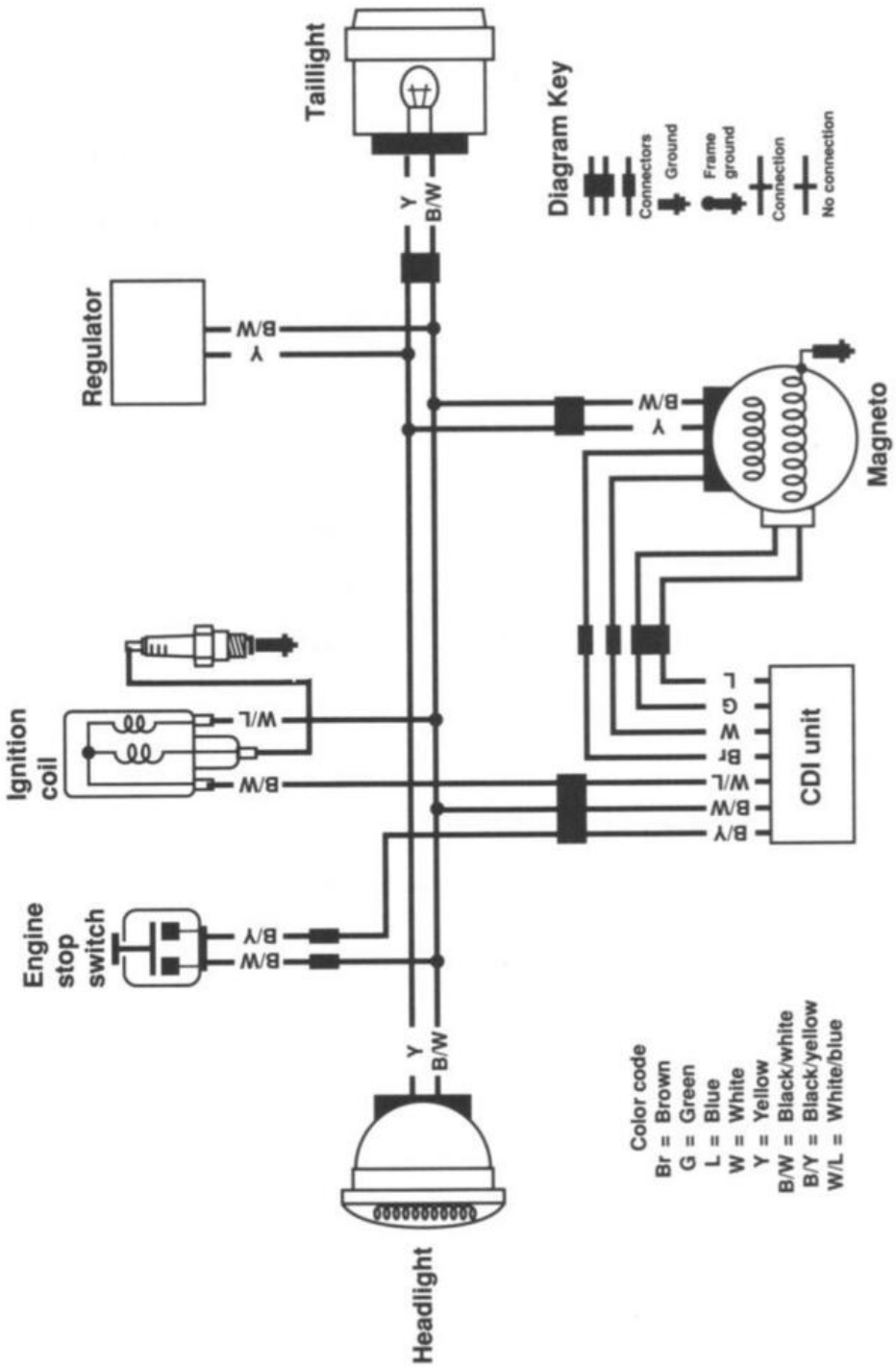
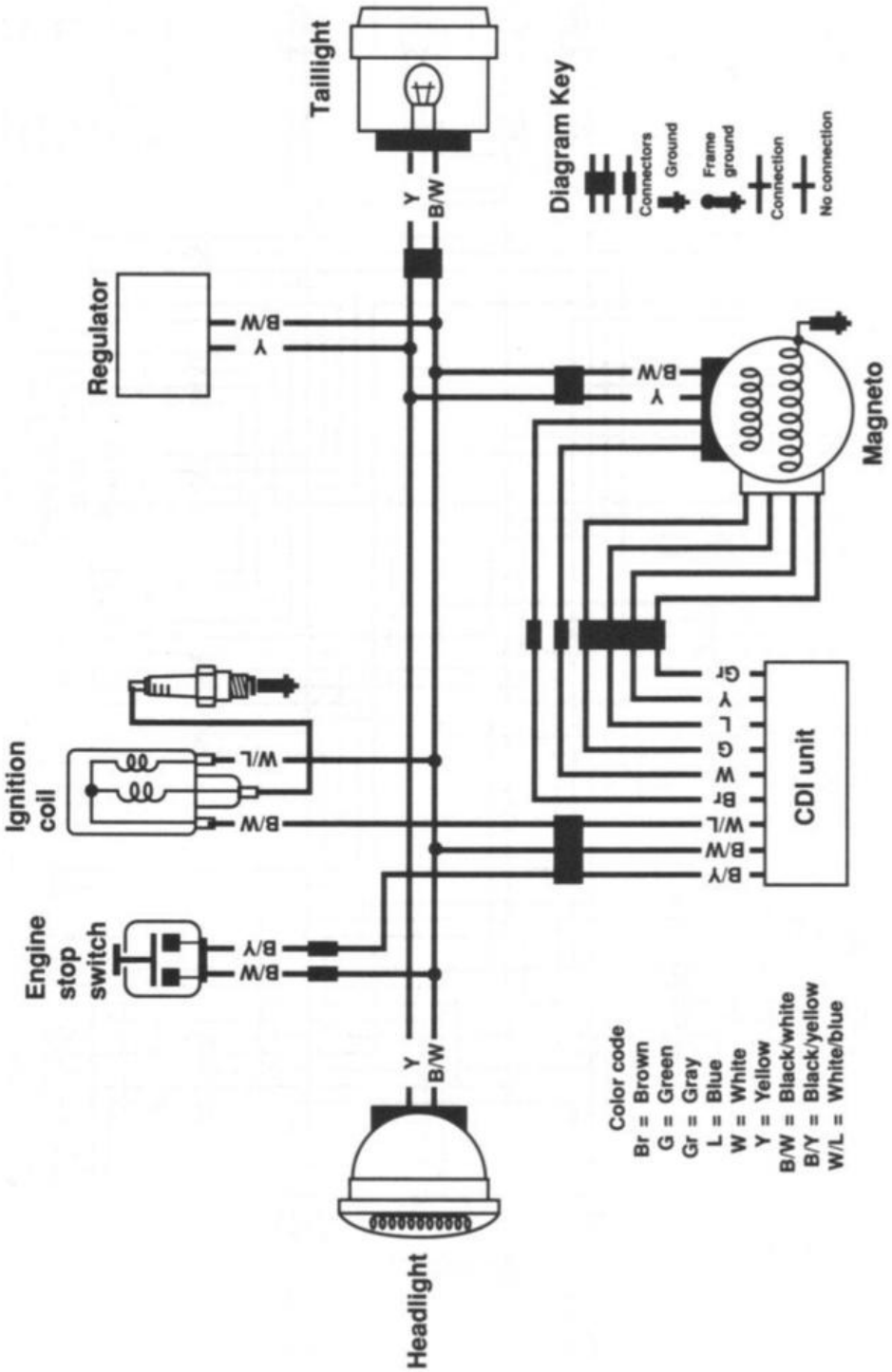
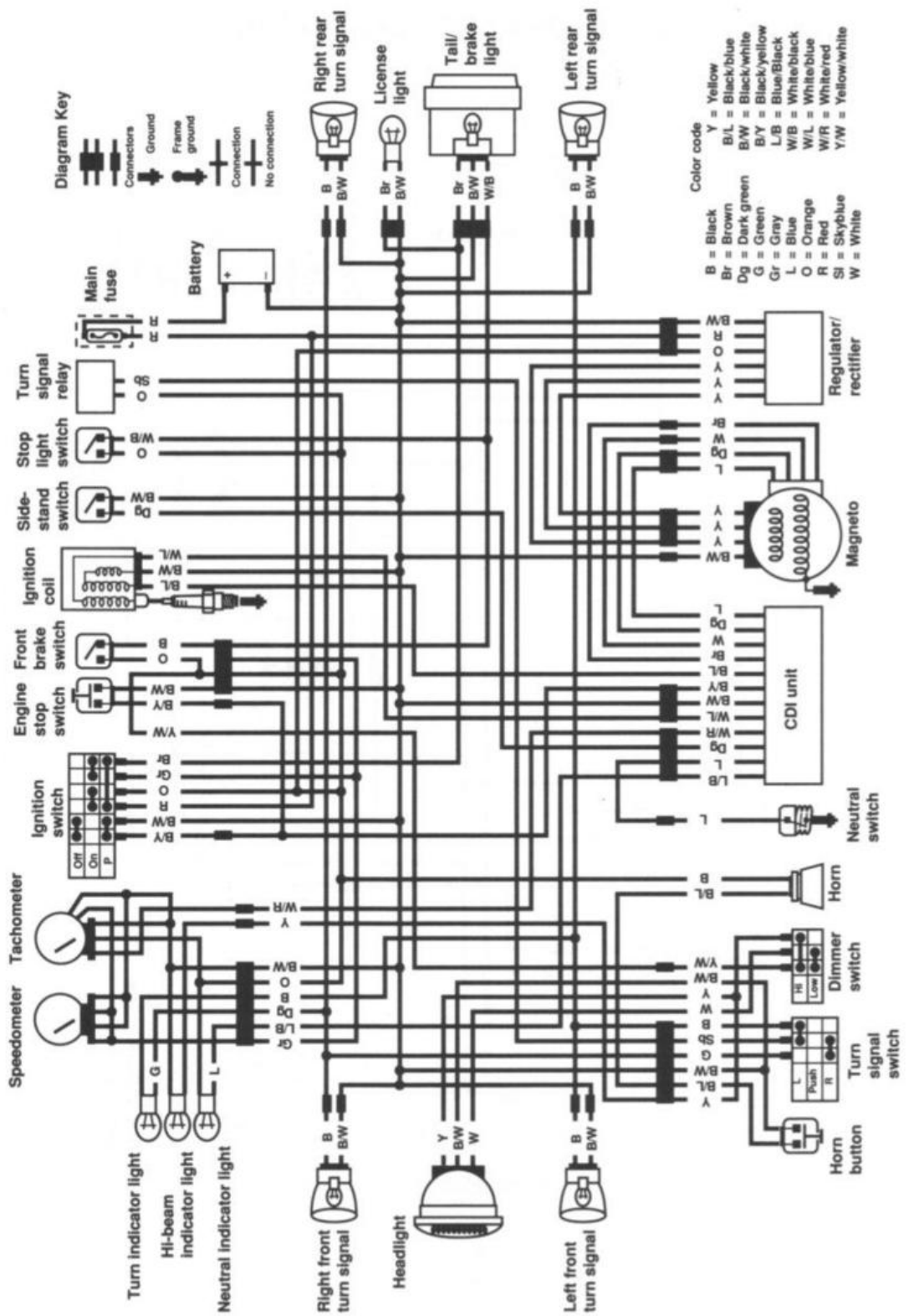
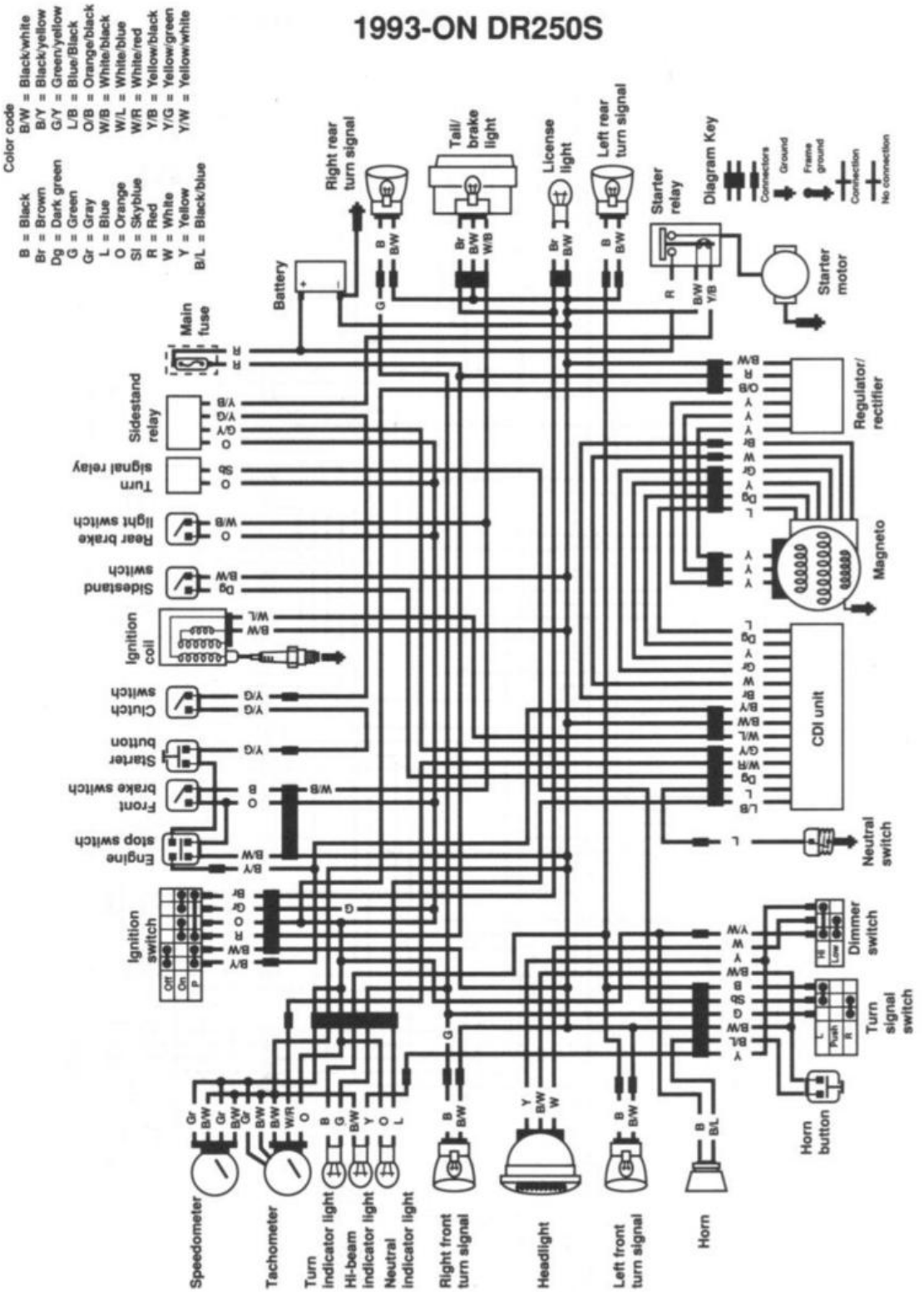
1990-1992 DR250 AND DR350



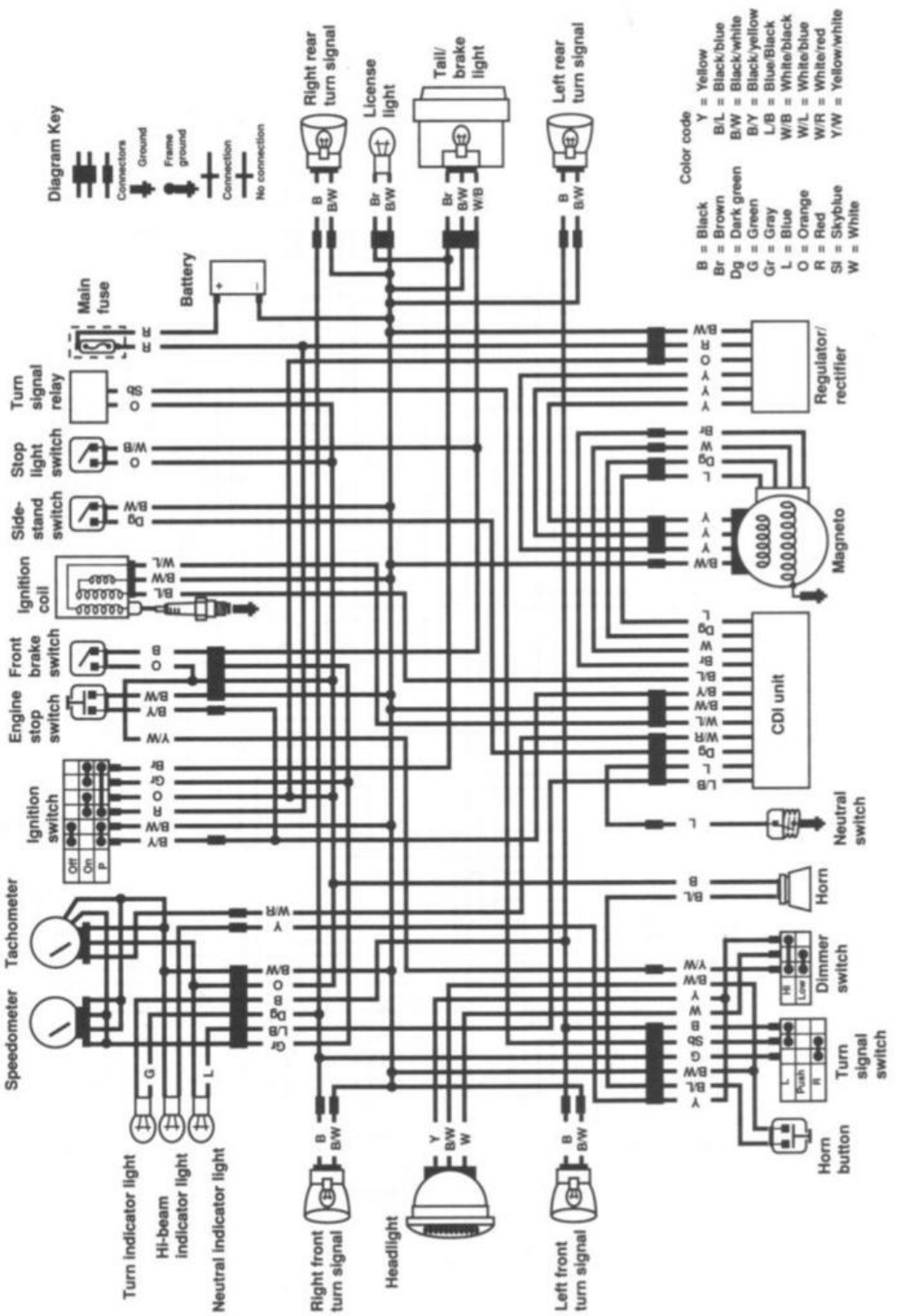
1993 DR250 AND 1993-ON DR350



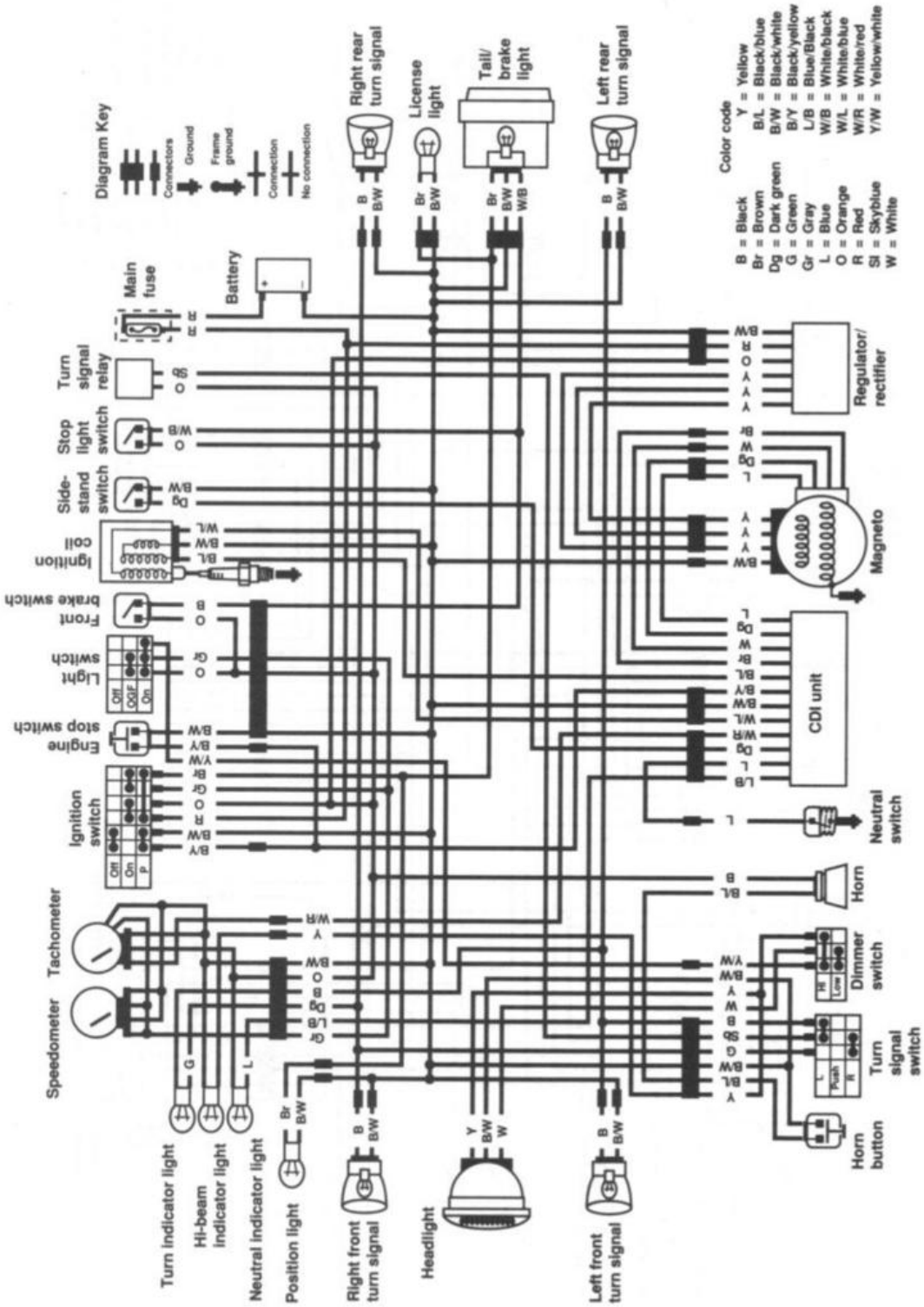

1990-1992 DR250S
Diagram Key
Connectors
Ground
Frame ground
Connection
No connection
Color code
Y = Yellow
B = Black
B/L = Black/blue
Br = Brown
B/W = Black/white
Dg = Dark green
B/Y = Black/yellow
G = Green
L/B = Blue/Black
Gr = Gray
W/B = White/black
L = Blue
W/L = White/blue
O = Orange
W/R = White/red
R = Red
Sl = Skyblue
Y/W = Yellow/white
W = White
Right rear turn signal
License light
Tail/ brake light
Left rear turn signal
Main fuse
Battery
Turn signal relay
Stop light switch
Side-stand switch
Ignition coil
Front brake switch
Engine stop switch
Ignition switch
Off
On
P
Regulator/ rectifier
Magneto
CDI unit
Neutral switch
Horn
Dimmer switch
Hi
Low
Turn signal switch
Push
L
R
Horn button
Speedometer
Tachometer
Turn indicator light
Hi-beam indicator light
Neutral indicator light
Right front turn signal
Headlight
Left front turn signal


1993-ON DR250S
Color code
B = Black
Br = Brown
Dg = Dark green
G = Green
Gr = Gray
L = Blue
O = Orange
Sl = Skyblue
R = Red
W = White
Y = Yellow
B/L = Black/blue
B/W = Black/white
B/Y = Black/yellow
G/Y = Green/yellow
L/B = Blue/Black
O/B = Orange/black
W/B = White/black
W/L = White/blue
W/R = White/red
Y/B = Yellow/black
Y/G = Yellow/green
Y/W = Yellow/white
Right rear turn signal
Tail/ brake light
License light
Left rear turn signal
Starter relay
Diagram Key
Connectors
Ground
Frame ground
Connection
No connection
Starter motor
Battery
Main fuse
Sidestand relay
Turn signal relay
Rear brake light switch
Sidestand switch
Ignition coil
Clutch switch
Starter button
Front brake switch
Engine stop switch
Ignition switch
Off
On
P
Regulator/ rectifier
Magneto
CDI unit
Neutral switch
Dimmer switch
Turn signal switch
Push
Horn button
Speedometer
Tachometer
Turn indicator light
Hi-beam indicator light
Neutral indicator light
Right front turn signal
Headlight
Left front turn signal
Horn

1990-1991 DR350S (U.S. AND CANADA)



1990-1992 DR350S (U.K.)



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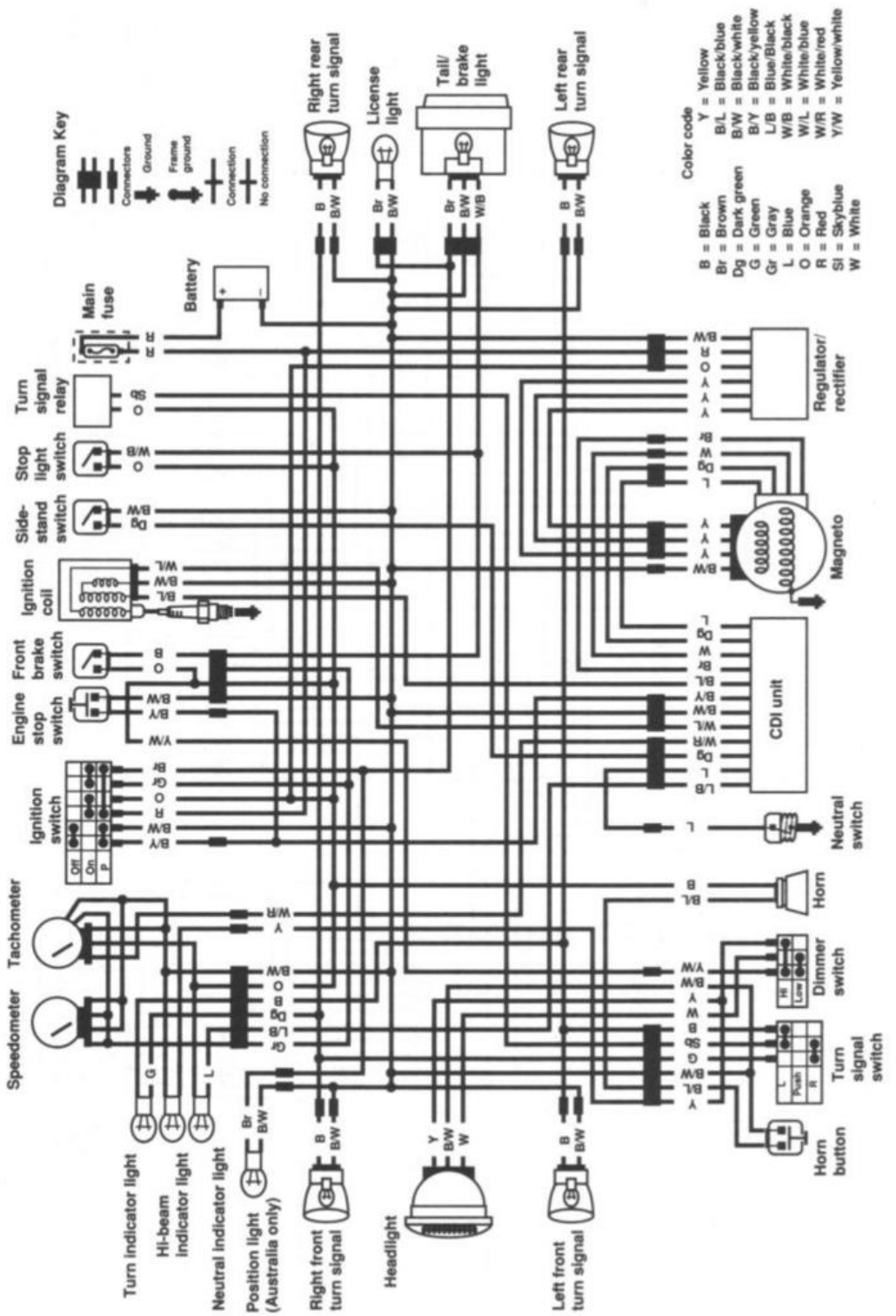
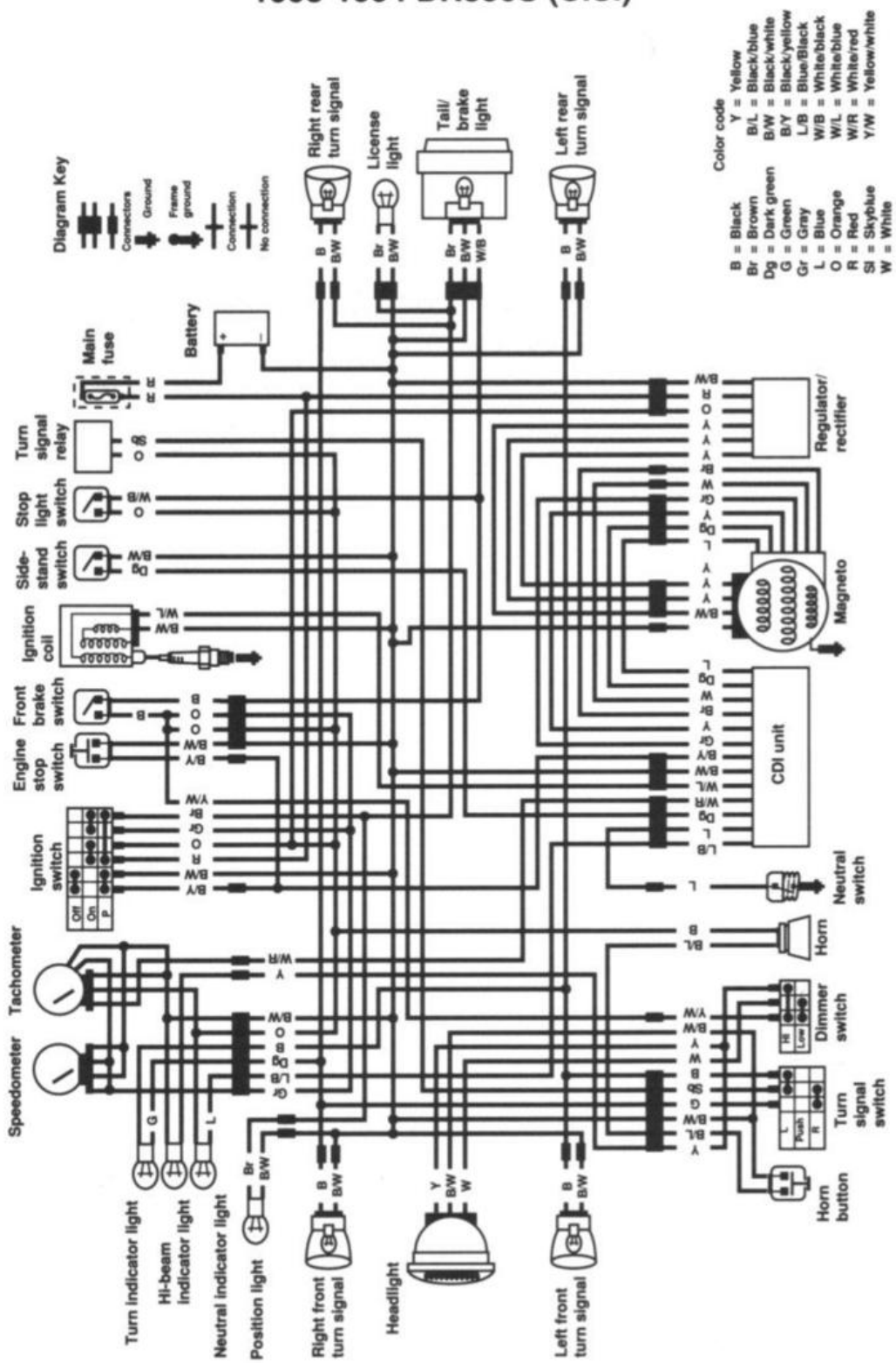
1992 DR350S (U.S. AND CANADA)



1993-1994 DR350S (U.S.)



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DR250-350 • 1990-1994

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